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SUSTAINABLE INTERVENTIONS FOR NEGRIL FISHER FAMILIES

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SUSTAINABLE INTERVENTIONS FOR NEGRIL FISHER FAMILIES

Prepared for

USAID/Jamaica
Development of Environmental Management Organizations (DEMO)

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LIST OF ACRONYMS AND TERMS

CIDA	Canadian International Development Agency
C-WIP	Coastal-Waters Investment Project
DEMO	Development of Environmental Management Organizations
EAST	Environmental Audits for Sustainable Tourism
EFJ	Environmental Fund of Jamaica
ENACT	Environmental Action Program
EU	European Union
IRR	Internal rate of return
JCDT	Jamaica Conservation and Development Trust
MBMP	Montego Bay Marine Park
MBMPT	Montego Bay Marine Park Trust
NCRPS	Negril Coral Reef Preservation Society
NEPT	Negril Environmental Protection Trust
NFC	Negril Fishermen Cooperative 1992, Ltd
NGO	Non-Government Organization
NIBJ	National Investment Bank of Jamaica
NPV	Net present value
NRCA	Natural Resources Conservation Authority
NRM	Natural resources management
RRA	Rapid rural appraisal
SDC	Social Development Communication
SO	Strategic Objective
SCCF	South Coast Conservation Foundation
TA	Technical assistance
USAID	United States Agency for International Development
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A Summary

This report presents the results of analyses carried out (during September - October, 1997) on possible alternative livelihood opportunities for fishermen in the Negril area who may be affected by the declaration of the area as a marine park It is perceived that the fishermen will be displaced to some extent as some areas will be closed and the fishermen will be obliged to travel further to fish on more congested banks Anticipating these impacts, USAID/Jamaica is considering an extension of the Development of Environmental Management Organizations (DEMO) project to provide support for the fishermen in Negril in finding and promoting acceptable alternative livelihood options The major objective for USAID is to stop and eventually reverse the degradation of the coral reefs (to be included in the marine park) by addressing one of the perceived causes for the degradation—over fishing

The approach consisted of conducting several rapid rural assessments (RRA) of fishing communities in the Negril area to elicit the social and cultural characteristics of the fishing communities, and to obtain information on fisher family perceptions on fishing, the environmental integrity of the coral reefs and the area in general, tourism, and alternative livelihood opportunities In addition, an overview was provided on the biophysical characteristics of the area, including the fishing and land-based resources and tourism

Based on the information obtained, three alternative livelihood options were considered a) fresh water fish farming (aquaculture), b) seamoss farming (mariculture), and c) sustainable tourism Others were discussed, but later dismissed for being unrealistic as far as the Negril fishermen were concerned In Montego Bay, for example, the team looked seriously at the prospects of investing in mother boats and improved fishing gear and equipment (which would allow fishers to stay out longer) This was quickly dismissed for the Negril fishermen as not applicable The majority of fisher families only have canoes and cannot travel far, and those who could participate would have nowhere to go reasonably nearby where the additional fishing effort could possibly justify the investments Other possibilities discussed were fishermen becoming reforesters of the watershed, or farmer/gardeners, or other possibilities not related to fishing These were also quickly dismissed, again by the logic expressed by everyone (including the fisher families themselves), that they are fishers, not farmers or foresters or anything else

The main premise of this report is that the proposed alternative livelihood options are financially feasible from the fishermens' perspective If the options do not make financial sense to the fishermen participation will not be forthcoming unless direct subsidies and/or financial incentives are offered The analyses carried out do not count on such subsidies or incentives in order to attain financial feasibility The results indicate that all three interventions are financially feasible based on conservative assumptions This is to say that participating fisher families are likely to be financially better off with the interventions than without them The harmful ecological impacts on the coral reefs will presumably decline in accordance with the reduced fishing effort USAID/Jamaica is, therefore,

encouraged to pursue an extension of the DEMO project with a view to supporting the Negril fisher families in acquiring the necessary skills and funding to implement the interventions Several conclusions and recommendations that USAID can incorporate into the terms-of-reference for the extension of the DEMO Project follow

B Conclusions and Recommendations

Conclusion 1: The coral reef ecosystem off the Negril area has been severely degraded over many years, due to natural and anthropogenic causes Excessive land-based nutrient inputs from coastal development, particularly tourism, are major current sources of stress on these reefs The health of the reefs will continue to deteriorate unless nutrient inputs into the coastal waters are drastically reduced

Recommendations pertaining to Conclusion 1

1 The Project should conduct an audit on the effectiveness of Negril's wastewater and sewage management systems in order to determine the areas for priority remedial action, concluding with the identification of and recommendations for the best available practice(s) for long-term containment and treatment The recommendations should then be presented to key individuals and institutions involved or concerned with wastewater and sewage management systems in series of meetings and workshops with a view to identifying funding sources and securing funding to implement the recommendations Detailed economic analyses of alternative options should be an integral part of the effort In addition to providing much-needed information for the existing hotels and tourism operators, the results of this effort will also provide Negril fishermen with much needed technical and economic information to include in the detailed planning for the their own tourism infrastructure developments

2 The Project should, in collaboration with other stakeholders (donors, NGOs, NRCA and others), determine the carrying capacity of the Negril area for tourism-related development so as to guide coastal resource management Factors to be considered should include beach degradation, use intensity, shore/marine flora and fauna, water quality, utilities and services, waste management, and socio-cultural and socio-economic impacts Of these, the latter is particularly important—correlating the influx of tourists with the influx of local hopeful tourism service providers who will not find jobs and have nowhere to live (other than squatting), and whose presence will contribute to increased crime and continued environmental degradation of the area

Conclusion 2: There is no active management of the fishery in the coastal areas utilized by Negril fishermen The size and type of catch has declined over the last two decades mainly through habitat degradation and increased fishing pressure Fishery stock will continue to decline if there are no appropriate management interventions

Recommendation pertaining to Conclusion 2 The Project should fund an effort to define the most effective control mechanisms for the local fishery in order to minimize the rate of stock depletion and to assist in stock recovery The Plan for Managing the Marine Fisheries of Jamaica, the Draft Provisional Management Plan for the Portland Bight Sustainable Development Area 1997-2000, and broad based consultation with researchers, fisher families and local authorities, should be utilized in the development of a fisheries management plan for the Negril area

Conclusion 3: Unsustainable and destructive fishing techniques such as spear fishing, seine nets and dynamiting are also negatively impacting the coral reef and contributing to the degradation of breeding grounds for juvenile fish This has been exacerbated by the increasing intrusion of fishermen from other parishes now fishing in the Negril Watershed It is, however, a sensitive issue as many local spear fishermen, aged 17-25, who lack assets such as boats and engines, will suffer from a ban on these activities It is anticipated that, without other means of income, many spear fishermen may turn to crime or harassing tourists

Recommendations pertaining to Conclusion 3

1 The Project should target young spear fishermen participation in any proposed alternative income-generating initiatives to reduce the dependency on this type of fishing effort as a main livelihood activity This should include workshops to enlighten the fishermen on the ramifications of proposed marine park regulations as few fully understand the conservation issues and perceive the regulations as in conflict with their rights

2 The Project should fund a study for the purpose of identifying the legislation needed to address sea tenure rights in order that local fishing communities can be protected from external fishermen using destructive fishing techniques in local fishing grounds

Conclusion 4: The proposed marine park zoning restrictions, intended to reduce and better manage fishing activities within one mile of the shoreline will partially displace an estimated 70 percent of fishermen currently active in these areas As fishermen without boats (as is the case of spear fishermen), and those with boats but no engines, will not be able to fish in waters beyond one and a half miles of the shoreline These fishermen represent the poorest fishermen in Negril as unlike trap fishermen who can attend to land-based activities once their traps are set, fishing is the mainstay of their livelihoods

Recommendation pertaining to Conclusion 4 The Project should target the displaced fisher families for support in terms of alternative livelihood opportunities This should include training for any of the alternative livelihood opportunities discussed in this report, as well as retraining in areas that would provide fishermen with the needed skills to compete for employment in the marine park or in park-related activities Some fishermen (at least one member from every community) are presently employed in marine park initiatives and reflect a greater understanding of environmental and management issues than other fishermen

Conclusion 5 Lack of appropriate training—it is concluded that the key institutions involved with or on behalf of the Negril fishing communities (NRCA, NEPT, and others) are lacking the necessary skills in economics and finance, management, marketing, and basic accounting The focus of any effort intended to improve the economic conditions of the Negril fishermen cannot be done without rigorous economic input and analysis All alternative livelihood opportunities considered for the Negril fisher families must, at a minimum, be subjected to analysis of the kind developed in this report to demonstrate that fishermen would be better off with the proposed interventions than without them

Recommendations pertaining to Conclusion 5

1 The provision of economic and financial analysis expertise should be added to DEMO's Project portfolio of technical assistance as well as to the staffs of NRCA and NEPT Specifically, it is recommended that the project will fund at least two intensive training sessions (of one to two weeks each) for different stakeholders One training session should be held for NGO personnel involved with fisher families and/or the management and protection of marine parks and/or reserves and the leadership of fishermen cooperatives The second training session be held for key NRCA personnel to introduce rigorous economic reasoning into the decision-making process The objective of the first training sessions will be to define the conditions under which proposed livelihood opportunities are financially and economically feasible from the perspective of individual fisher families For the second session, the objective will be to foster an understanding of and appreciation for the importance of economics as an integral part of the decision-making process in natural resource management The TA trainer conducting the sessions should remain involved during the DEMO extension period to work, in a consultative capacity, with the individuals trained and follow up on specific proposals as they emerge (both on behalf of fisher families and other priorities for the NRCA)

2 DEMO should fund basic training in marketing, management, and basic accounting specifically intended for the fisher families The analyses of alternative livelihood options presented in this report generate results based on the assumptions that the operations are well managed and that the markets for the products are present, i e , that all of the seamoss and fresh-water fish produced will be sold, and that the tourist facilities built will be occupied by paying tourists While the assumptions used are conservative and probably realistic, they are still only assumptions Fisher families still do not have the requisite skills in marketing, management and/or accounting to ensure that the operations are profitable It is recommended, therefore, that all economic feasibility work (recommendation 1) be complemented with basic training in marketing, management, and basic accounting tailored to the specific interventions proposed The fisher families interested in participating in seamoss farming would benefit greatly from training in technical and business management practices and marketing of the products (whether it should be marketed as value-added products and, if so, what would be the optimal production scenario, etc) Furthermore, it is equally important for the participating fisher families to acquire basic skills in accounting

1 INTRODUCTION

1 1 Background

The imminent declaration of the Negril and Green Island Area Environmental Protection Plan and the Marine Park has prompted USAID into considering options for the possible extension of the Development of Environmental Management Organizations (DEMO) Project, including interventions to aid fisher families who may be affected by the declarations USAID's main concern is to maintain the ecological integrity of the coral reefs included in the marine park The current effort focuses on one probable (albeit small) cause for the degradation of the coral reefs, namely the fishing effort by some 500 to 600 artisinal fisher families in the area[1] The concern falls within the USAID's mandate under Strategic Objective 2 "Increased protection of key natural resources in environmentally significant areas" (USAID/Jamaica, 1997) The goal is to reverse the trend of over fishing through policy reforms and the provision of alternative economic livelihood options

This report is the first step in the process of identifying where and how USAID could provide support under the probable extension of the DEMO project A team of three consultants to the DEMO project (Kjell Christophersen, Floyd Homer, and Jackie Grant) spent three weeks in-country during the period September 20 - October 18, 1997 to interview key individuals and institutions, collect data, and carry out the preliminary analyses presented in this report

1 2 The Problems

Full and part time fisher families in Negril may be affected by the probable restrictions on fishing and fishing effort in the area as a result of the Marine Park declaration If some areas in close proximity to the beaches are closed to fishing, fishermen must travel further to reach different banks where they are likely to catch less fish at higher costs (because of increased congestion) The extent to which (or if) fisher families will be affected, however, cannot yet be known because the Marine Park has not yet been declared, nor has a management plan been prepared What is clearly observed, however, is that a) fish catches have declined over the past several years with roughly the same fishing effort, and b) fishermen will typically opt to increase their fishing effort to remain fishermen instead of abandoning the profession and become farmers or doing something else to make a living So long as there is fish there will be fisher families in the Negril area

Given these observations, alternative livelihood options are limited In the judgement of the team, they must be related to their present profession or they will not work It is obvious, for example, that the entire watershed inside the proposed protected area is degrading because of poor forestry and/or agriculture management practices resulting in soil erosion on a large scale that eventually drains into the marine environment and contributes to the degradation of the coral reefs Moreover, the increased tourism in the area is accompanied by large influxes of people hoping (most

[1] Although the artisinal fishermen in the Negril area depend on fishing for their livelihood they are not classified as commercial fishermen

often in vain) for employment in the tourism sector or as providers of tourism-related services More often than not, these people do not find any place to live and their only option is squatting, often along the river banks which contributes greatly to water-borne pollution of the rivers and the marine environment These and many other examples could certainly translate into employment opportunities for the fisher families They are not considered in this report, however, because fishermen will not likely choose to become reforesters of the watershed, nor will they choose to become employees of hotels or tourism-service institutions[2] Because fisher families will likely opt to remain independent, the alternative livelihood options analyzed here are limited to those within the full control of the fisher families and are fish- and/or water-related

1 3 Possible Sources of Funding

It is envisioned that USAID's mandate in the proposed extension of the DEMO Project will be to build capacity through training and technical assistance (TA)—not to directly fund the field activities themselves If the fishermen ask for infrastructure on a conveniently located beach to house the cooperative offices, provide repair facilities for the outboard motors, and the like (as have the Negril fishermens' cooperative), USAID will not provide this free of charge to the fishing communities If the proposed activities are judged financially feasible (bankable), on the other hand, USAID could play a major role by focusing on how the communities could obtain credit to implement the interventions This could range from providing credit guarantees on behalf of the fisher families vis-a-vis the lending institutions, to providing technical assistance to the fishermens' cooperative in how to develop bankable proposals and presenting them to the lending institutions What is important in this respect is that USAID plays a major role in securing funding for the field activities from the various agencies including a) local banks, b) international development banks, c) USAID's NGO Grants component in the upcoming C-WIP Project, d) the European Union (EU), e) The Environmental Fund of Jamaica (EFJ—US $23 million), and many others [3]

1 4 Approach, Analytical Model, and Limitations

1 4 1 Approach

Background information on the status of the fisheries, fisheries management practices, coral reef, tourism and other resources in the project area were gathered from existing publications and

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[2] Fisher families almost unanimously preferred to remain as fishers or in fish-related activities, based on the RRA results

[3] The standard answer to the inevitable question of where to find funding is to seek it through other projects and/or donors Donors however usually have their own mandates carved out project regions and limitations on the specific mandates of their projects—more often than not outsiders do not qualify for funding In Jamaica however the existence of several funding institutions that support bankable proposals may prove to be the answer to this problem for the Negril fisher families so long as proper economic and financial justification accompany the funding applications

through interviews with key individuals from state and private agencies, as well as from non-governmental organizations

The approach to determining the alternative livelihood options for the Negril fisher families is based on a) rapid rural appraisal (RRA) of fishing communities, and b) the priorities expressed by the leadership of the Negril Fishermen Cooperative of 1992, Ltd (NFC) Neither of these may adequately reflect the priorities of the entire population of some 500 to 600 fisher families in the area because all of them did not have the opportunity to state their priorities Moreover, the NFC exists largely on paper—it does not necessarily reflect the priorities of all fisher families It is important to note in this context that the strong independence characterizing the Negril fishing communities will preclude arriving at any sort of consensus as to what the true priorities are The team listened to the priorities expressed by the fishermen interviewed, therefore, and selected those that met with the fewest common objections among them The interventions analyzed, therefore, are not endorsed by all fisher families for many reasons, but those who object are fewer than those who endorse

In most cases, the analytical perspective is that of the individual fisherman, not the fishing community or the NFC This is in recognition of the fact that fisher families are independent and work best if not constrained by a management structure of some form (where the fishermen become employees of an organization) The function of the cooperative should be to serve the individual fisher families as they pursue their self interest in the form of providing inputs at wholesale prices The cooperative, ideally representing all fisher families, should be able to procure most all inputs at wholesale prices that where the fishermen and cooperative share the savings generated by the difference between retail and wholesale prices

1 4 2 Analytical Model

The analyses in Sections 4 and 5 were carried out on spreadsheet using Lotus 123 version 5 The analytical model developed for purposes of the study allows the user to determine the financial feasibility of the proposed field interventions from the perspective of the individual fisher families, per intervention, and in the aggregate in accordance with specific targets As such, all results are expressed in terms of net present values (NPV) and internal rates of return (IRR) where appropriate[4] The IRRs are not presented where the nature of the cash flows is such that multiple answers are probable, or where there are no negative cash flows[5] The analytical time horizon for the analyses is 15 years to account for all capital investments and recurrent costs over a relatively long time period

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[4] The activity analyzed is judged financially feasible if the NPV is equal to or greater than zero and if the IRR is equal to or greater than the opportunity cost of capital (defined as the rate of return one could reasonably expect to obtain from investments with risk levels similar to those analyzed)

[5] Multiple IRRs are possible when the net cash flows (NCF) are 'irregular' i e negative numbers are followed by positive numbers followed again by negative numbers etc If there are no negative numbers in the NCF the IRR cannot be computed because there is no discount rate which can set the NPV equal to zero In this case the NPV must by definition always be positive—it can never be zero

The model is structured to allow users to input different variables and thus generate different streams of costs and benefits

1 4 3 Limitations

In the brief time available to carry out these preliminary analyses on behalf of the Negril fisher families, several limitations are obvious First, only a relatively small fraction of the 500 - 600 families in the area were interviewed, hence the analyses do not necessarily reflect the views of all the families Second, the fisher families were not all interested in the same alternative livelihood options For example, the majority of respondents interested in the tourism market were already involved with tourists (snorkeling excursions and the like) to some degree and were interested in adding to their options in the tourism field Other fishermen were not interested in tourism at all and preferred assistance in other areas such as deep sea fishing, mariculture and aquaculture Third, marketing studies for the products or services produced as a result of the alternative livelihood options discussed here were not carried out It was assumed instead that the products and services produced could be sold Fourth and last, the alternative livelihood options subjected to analysis are but a small fraction of the many opportunities available to the Negril fisher families It is not at all certain that the interventions included will be implemented in the magnitudes envisioned, nor in the configurations presented

Other options were discussed but dismissed for being unrealistic as far as the Negril fishermen were concerned In Montego Bay, for example, the team considered the prospects of investing in mother boats and improved fishing gear and equipment (which would allow fishers to stay out longer) This was dismissed for the Negril fishermen since the majority of fisher families only have canoes and cannot travel far, and those who could participate would have nowhere to go reasonably nearby where the additional fishing effort could possibly justify the investments Other possibilities discussed were fishermen becoming reforesters of the watershed, or farmer/gardeners, or other possibilities not related to fishing These were also quickly dismissed, again by the logic expressed by everyone (including the fisher families themselves), that they are fishers, not farmers or foresters or anything else

2 THE NEGRIL AREA RESOURCES AND RESOURCE USERS

2 1 Introduction

The Negril study area is located on the coast at the western end of Jamaica in the parishes of Westmoreland and Hanover For the purpose of this assignment, the boundary of the study area is consistent with that used in the Negril and Green Island Area Environmental Protection Plan (1995) which utilized the 1991 enumeration district boundaries and those of the Negril watershed

Negril has evolved from a fishing village to a vacation resort area during the last 20 years, leading to a change in the nature of the landscape primarily along the coastal strip which is now dominated by hotels, cottages and guest houses

2 2 Negril Area

2 2 1 Biophysical Characteristics

The Negril Development Plan (1994) had divided the area into four characteristic sections, namely a) a series of white sand beaches separated by coral promontories running north-south along the coast for about 12 kilometers, varying in width from 61 meters to 366 meters, b) the Great Negril Morass, a wetland with an area of about 2,428 hectares located directly inland from the beach strip, c) a strip of high ground to the east of the Morass, sloping to steep ridges and heavily vegetated limestone hills, which serve as the aquifer recharge area, and d) the Negril Hills, composed of rugged limestone rising to a little over 152 meters at the highest point, adjoining the rocky coastal shelf three to six meters above sea level, containing faults, caves, crevices, sinkholes and fossil reefs

Abundant flora and fauna have been recorded by the NRCA and the Traverse Group (1981) for the Negril Morass These include 136 plant species of which 14 are endemic, including the Royal Palm (*Roystonea princeps*), 27 species of fishes, and 52 species of birds which include the Little Blue Heron (*Florida caerulea*), Green Heron (*Butorides virescens*), Northern Jacana (*Jacana spinosa*), and the Pied Billed Grebe (*Podilymbus podiceps*) as the most commonly observed aquatic birds

The coastal marine environment of Negril is composed of fringing coral reefs, sea grass beds and sandy bottom lagoons which are habitats for several species finfish and shellfish caught by the fishing community NRCA and the Traverse Group (1981) identified 43 species of commercially important juvenile fishes in the near shore Negril area Although the health of coral reefs had deteriorated in recent years, Goreau (1992) found that the common types of coral in Negril were *Millipora* sp , *Madracis* sp , *Agaricia* sp , *Montastrea* sp , and *Siderastrea* sp

2 2 2 Fishery Resources

No detailed survey of the fishery resources was ever conducted for Negril The Plan for Managing the Marine Fisheries of Jamaica (1997) and discussions with Negril fishermen, however,

indicated that several species were the main targets depending on the location and time of the year The major target species for shallow shelf and reef fisheries were Hind (*Serranidae*), Parrotfish (*Scaridae*), Grunts (*Pamadosydae*), Triggerfish (*Balistidae*), Squirrelfish (*Holocentridae*), Surgeonfish (*Acanthuridae*), Butterflyfish (*Chaetodontidae*), Conch (*Strombus gigas*) and Lobster (*Panulirus argus*) The target species for deep slope fisheries were Snapper (*Lutjanidae*) and Grouper (*Serranidae*), and for large pelagics were Tuna (*Scombroidei*), Billfish (*Istiophoridae*), Dolphinfish (*Coryphaena hippurus*), Wahoo (*Acanthocybium solandri*), and Shark (*Elasmobranchii*)

The fishers had commented on the noticeable decline in the abundance, size and type of catch over the past two decades, which was consistent with the observation of researchers and fishers elsewhere in Jamaica Since 1976, the Jamaican fishery was characterized by declining catch rates as fishing intensity increased, for example, the catch per unit effort in 1981 had declined by 59 percent relative to the 1968 value (Aiken, 1992)

2 2 3 Land-Based Resources

The upland areas are predominantly limestone of exploitable commercial value for the construction industry and several small quarries are in operation The limestone hills, particularly those to the east of the Morass are covered by secondary vegetation, moist forests and dry forests which protect the watershed and provide valuable habitats for several species of fauna Some harvesting of local timber is done for the building of fishing canoes, light construction, tool handles, and as fuel wood, however, the extent of this activity has not been quantified

The main source of raw water is the Orange River Blue Hole and the Fish River Blue Hole which supplies Lucea and Negril, and will provide 7 5 million gallons per day through the Lucea Negril Water Supply Improvement Programme to satisfy demand up to the year 2015

2 2 4 Tourism

Negril is largely known as a "sun and surf" tourism destination because of white sand beaches, perceived clean water, beautiful coral reefs, and abundant opportunities for water-based recreation activities The low and high seasons are January through April and May through December, respectively, as indicated in Table 2 1 The number of bed nights sold in Negril increased from 967,000 in 1993 to 1,037,000 bed nights in 1996, an increase of roughly seven percent over the 4-year period Because of an 18-percent increase in the number of rooms, however, the average annual occupancy rate has declined from 67 8 percent in 1993 to roughly 60 7 percent in 1996 (still a fairly healthy occupancy rate compared to many other resort destinations) One additional large hotel (more than 200 rooms) is currently under construction, and two more are planned for 1998 According to the Jamaica Tourism Board, additional tourism developments (more hotels) will probably occur over the next several years because the demand for beach access is strong and growing Negril is also slated for funding under the Sustainable Development for Environmental Tourism (SET) program whereby infrastructure investments in the beautification of the town,

sidewalks, and hiking trails, etc are made to improve and enhance the overall experience for the tourists

Most of the large hotels offer all-inclusive tourism packages including meals and beverages, as well as many recreation activities Guests can sign up to use canoes and/or small sailboats free of charge, they can take coral reef excursions in glass bottom boats owned by the hotels, and participate in snorkeling and/or diving excursions without any extra charges Guests who do not choose the all-inclusive packages have choices of many restaurants in or near Negril

Table 2 1 Bed Nights Sold and Category of Rooms, Negril

No bed nights sold, Negril	1993	1994	1995	1996
Lo season Jan - Apr	337 053	374 192	373 908	402 202
Lo season room occupancy	72 9%	73 1%	71 2%	72 3%
Hi season May - Dec	629 792	607 765	667 502	634 680
Hi season room occupancy	65 4%	57 9%	60 8%	54 9%
Total	966,845	981,957	1,041,410	1,036,882
Year around occupancy rate	67 8%	62 9%	64 2%	60 7%
Category of rooms	1993	1994	1995	1996
No rooms in hotels with < than 50 rooms	520	703	743	862
Between 51 and 100 rooms	486	538	538	538
Between 101 and 200 rooms	659	464	464	464
More than 200 rooms	608	823	823	823
Total	2273	2528	2568	2687

Source Jamaica Tourist Board, Annual Travel Statistics, 1996

2 3 Resource Degradation

Over the last 25 years, various impacts from land based development and natural phenomena have resulted in a decline of the health and abundance of marine species Williams and Polunin (1997) summarized the chief stresses on reefs in the Caribbean as heavy fishing pressure, sedimentation, from dredging and coastal development, excessive nutrient loading from human and agricultural sources, hurricane damage, die-off of the major invertebrate herbivore (*Diadema antillarum*), and coral diseases

Goreau (1992) surveyed the reefs in the Negril area during November 1991 and found that the corals throughout Long Bay were under moderate to severe stress from algal, sponge and soft coral overgrowth, sediments, nutrients, coral bleaching, boat and diver damage His comparison with results from a 1960 survey, showed that by 1991, there was an almost complete elimination of the two most common shallow water branching coral species (*Acropora palmata* and *Acropora cervicornis*), severe bleaching impact to the most abundant deeper water coral species, over-growing of all corals by other organisms, and marked decrease in coral cover at inshore sites

Extensive overgrowth of fleshy green algae, such as, *Lobophora* sp , and *Dictyota* sp , were common in the 1991 survey and were attributed to nutrient enrichment from increased tourism development There are currently about 400 hotels, guest houses, and cottages along the Negril

coastline which accommodated almost 250,000 stopover arrivals in 1996 (Tourist Board, 1997) Much of the wastewater and secondary treated sewage from these establishments eventually finds it way to the sea through percolation and movement through fissures in the limestone substrate

Sewage effluent and wastewater were discharged into the bays in Negril have not been monitored with regular frequency, however, the available data show that at certain times of the year, the water quality is within compliance Faecal coliform values higher than the standard were generally recorded after flood and heavy rainfall events These events result in increased faecal matter being washed into the coastal waters due to the associated large volume of water and the flushing of inland areas The existence of squatter settlements along the bank of the South Negril River and gullies which discharge waters into the beach also contributed to high faecal coliform counts (NRCA, 1996)

Faecal coliform levels at five sample points in Long Bay, taken in September, 1996, were within compliance The Negril Community Center Beach sample point exceeded the United States Environmental Protection Agency standard (200 MPN /100 ml) by 50% during the same time period as the other sites (NRCA, 1996) Faecal coliform levels at eight sample points along the Negril Community Center Beach taken in August 1997, did not exceed bathing limits, however two additional sample points at the mouth of the South Negril River were 6 and 17 times greater than USEPA standards (Berger International Inc , 1997)

Nitrate levels at the same sites in the NRCA survey were within Environment Control Division (ECD) standards (10 ppm) but exceeded the maximum threshold concentrations for healthy reefs by 4-8 times Phosphate levels at the same sites were within ECD standards (4 ppm) but exceeded the maximum threshold concentrations for healthy reefs by 16-50 times for five sites and by 83 times for the Negril Community Center Beach sample point Bell (1992) and Lapointe (1992) had determined 014 ppm nitrogen and 003 ppm phosphorus as the maximum threshold concentration for healthy coral reefs

Continued degradation of the habitat will lead to a reduction of fishery stocks and increased fishing pressure will exacerbate the condition of the coral reef fishery There is currently no data available on the stocking and sustainable yield, or on the carrying capacity of the shallow shelf and reef fishery in Negril Based on interviews with the Negril fishermen it is clear that there has been a decline in the catch size and its species composition over the past two decades despite increased fishing efforts

2 4 Resource Users The Social and Cultural Context

2 4 1 Rapid Rural Assessment

Rapid Rural Appraisals (RRA) of six fishing communities around Negril were carried out in order to a) establish the social structure of the fishing communities in the target area, b) determine fishermen's understanding of the rules and regulations likely to govern the Marine Park and the knowledge-base of fisher families with regard to resource conservation issues, and c) identify the

constraints to peaceful partnerships between fisher families, other resource users and protected area managers All (points a, b, and c) are intended to determine how fisher families may be involved in the decision-making process relating to protected area management

Outsiders often perceive fishermen as uncaring perpetrators of marine degradation who lack knowledge of environmental processes This perception was not confirmed by the RRA field work The RRA Methodology consists of a set of tools and techniques which emphasizes local knowledge and enables local people to analyze their conditions, perceptions and preferences and prepare their own agenda for action RRA is, therefore, an enabling tool allowing fishermen to be heard, a phenomenon not often considered in development planning It is an iterative and flexible approach particularly appropriate to the investigation of complex, causal relationships such as the interaction between people, their environment and the institutions that represent them

In RRA, the reliability of findings is assured through the use of techniques of triangulation—the verification and comparison of information and perceptions through the use of different techniques and sources to investigate the same key issues In qualitative research, such as this, the in-depth investigation in a relatively small number of communities is based on purposive as opposed to random sampling, i e , identifying representative study communities in accordance with criteria that reflect key factors affecting the issue under investigation Within these communities, the RRA is conducted with sufficient numbers of groups as to be representative of the communities Participants in this study were selected by key community informants and, except where otherwise stated, the information produced is derived through consensus This is to ensure that the information reflects the general perceptions of all participants and excludes individual bias The techniques applied in this study are contextualized to reflect the sociocultural norms of Jamaican society

Eighty fishermen and 17 women representing 20 percent of the six fishing communities presently under the auspices of the Negril Fishermen Cooperative 1992, Ltd (NFC), participated in a series of RRAs carried out between September and October, 1997 In all studies, representatives of the fishing communities were present as key informants to the process The fishing communities examined were Green Island, Orange Bay, S Negril River, Little Bay, Homer's Cove and Broughton (locally referred to as Brighton) For the purpose of this study, and as the fishermen themselves requested, the division of the six fishing communities reflect the interest of three broad based groups, Green Island/Orange Bay, S Negril River, and the communities of Little Bay which incorporate Homer's Cove and Broughton

Pairwise ranking and matrix exercises were used to elicit fishermen's perceptions of current and alternative livelihood strategies whereas all of the fishing techniques were examined against five criteria established by the fishermen Fishermen's perceptions of the role of local and national institutions were depicted through Venn diagrams which helped to generate debate on the significance of various institutions to local people and the levels of communication between fishermen and the institutions and the role and influence of fishermen in forming the fishing cooperative agenda Information regarding wealth, income levels and the division of labor by sex, were determined through semi-structured interviews and transects A systems analysis of household types is contained

in a table in Annex C Exercises were carried out in groups of 5-6 with key informants providing support to all participants The meetings and interviews were recorded on tape

2 4 2 Fishing Techniques, Equipment and Costs

Fishermen from all communities visited use a wide range of fishing techniques which include line fishing (both drop-line and strolling), fish traps, spear fishing, tour fishing, tuck net and seine Among them, the use of fish traps is the most popular with more than 60 percent of fishermen regularly using this technique

Fish trap sizes range from 18 inches in height up to five feet However, as the largest traps are heavy and therefore difficult to recover, they are not normally placed at more than 30 feet depth The fishermen are able to examine the size of the catch before retrieval by using a sheet of glass placed on the surface to determine the amount of fish caught Large traps can be left for up to eight days (but normally inspected every three) before retrieval if the view from the glass is not enough to "fill your eyes" Small pots are left for up to four days, but can be left longer when poor weather conditions prohibit fish from being attracted by the bait

The most commonly used bait is leftover bread from the bakery which is sold for approximately J$150 for 10-15 loaves Roasted moray eels, pumpkin, cassava and coconut are also utilized The most common form of line-fishing bait is the soldier crab and skinned moray eel However, fishermen generally consider sea urchins to be the most efficient bait but report that these have largely disappeared from Jamaican waters over the last 10 years [6]

The most commonly used engines are between 25-40 horse-power with a life of between 5-10 years if well maintained[7] The 40hp engine is the most popular as they can withstand greater pressure and changes at sea However, the life of the engine is dependent on many factors related to the frequency of fishing outings, weather conditions, time spent at sea and distances traveled

The fish traps have a useful life of 10 to 12 months (but can be destroyed outright, in rough seas) and, depending on the size of the trap and the mesh used, cost between J$3,800 and J$6,000 to build, including labor and materials The cost of 25hp-40hp boat engines range from J$80,000-J$120,000 To fishermen, the capital costs involved in fishing are high, especially since equipment is often lost or damaged A common concern is that the durable 'Belgian' wire is no longer sold locally because suppliers profit more by selling cheaper, weaker wire

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[6] A common perception is that sun-tan lotions washed into the sea from tourists kill the sea urchins

[7] Fishermen interviewed in Montego Bay said that the majority of outboard motors were poorly maintained for lack of maintenance facilities spare parts and expertise Consequently the motors would rarely last more than two years The situation in Negril is similar to that in Montego Bay

2 4 3 Income

Due to the unpredictable nature of the resource, the different techniques used, catch sizes, seasonality, and other income sources, the fishermen actively resisted the idea of fixing figures for income levels Even rough estimates or ranges of figures were seen as overly deterministic and simplified At Little Bay for example, catches of up 30/40lb were reported to be common during the *running season* (October) but not sustainable throughout the month Therefore it is only possible to predict this size of catch occurring twice a week during that month Calculated at J$80 per pound, income derived from fishing during October is between J$9,600 and J$12,800 This is a best case figure On the other hand, fishermen at Orange Bay reported having catches of up to 80-120lbs during October, producing significantly higher returns than those at Little Bay, Homer's Cove and Broughton[8]

These estimates were derived from fishermen involved mostly with trap fishing Deep sea line fishermen who catch rarer varieties of fish and can demand higher prices for their catch were equally unable to reliably predict income derived from this type of fishing even on a weekly basis In fact, they were unwilling to estimate figures, seeing the parameters of these calculations as too flexible to allow meaning Much of the money earned from fishing goes back into purchasing of fishing gear

2 4 4 Marketing

The RRA revealed that demand for fish is generally greater than the supply No formal marketing structure for trade exists in any of the fishing communities within the Negril watershed Fishermen have regular customers who normally order fish in advance of the catch In Orange Bay and Green Island, fishermen act as intermediaries for the sale of fish to customers who live up to six miles away Poor roads and lack of transport prevent the fishing communities of Little Bay having access to local markets, (the closest being Little London, 6½ miles away) and consequently most of the fish caught is sold (cheaply) to community residents Small-scale local bars and restaurants are the mainstay of the fishing industry in Negril Fisher families complain that their supply is not reliable enough for large scale hotels to buy They report that large hotels purchase fish from Whitehouse and Savannah-La-Mar (35 miles away) Many fishermen stressed the desirability of a simple building in which buyers could wait for the catch

2 4 5 Organization of Work

Between 20 and 25 percent of fishermen employ laborers to set large traps or assist in *strolling* (long line fishing at high speed) Laborers are paid 25 percent of the day's catch and do not share fuel or equipment costs The risks taken by the boat owner with respect to the rapid depreciation and potential loss of equipment, however, tend to reduce the social and economic distance between boat owners and laborers

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[8] Incomes from fishing are estimated for purposes of the financial analyses in Section 4 4 below

2 4 6 Division of Labor by Sex

Women are normally confined to shoreline activities due to the size of most small-scale fishing vessels and degree of coordinated activity required in cramped work areas Also, shoreline activities do not conflict with child care responsibilities Unlike many other fishing communities in Jamaica and the Caribbean, women in Negril do not take on the buying and selling role Of the 17 women participating in semi-structured interviews, only two sell fish on a regular basis Primary activities carried out by women include running small grocery and hairdressing shops, bars, and employment in the tourism industry, normally as unskilled staff in large hotels and beach resorts Most women perceive fishing as a reliable source of income provided that the fishermen maintain and occasionally upgrade their equipment and travel out to the cays where fish stocks are in greater supply The women often provide financial support to their husbands and partners to buy fishing gear—they see this as an investment

2 4 7 Local Perceptions of Poverty

Economic well-being analysis revealed that, in general, poor fishing communities perceived poverty, not as an income-based phenomenon, but in terms of asset ownership Fisher families judge their own wealth levels by their asset ownership The majority perceives that fishing technology with the ability to improve boat speed, diversity, and catch size, would provide an escape from the downward poverty spiral Fishermen perceive assets such as boats with high-powered engines as enabling them to broaden and diversify their activities away from fishing in times of need and as a saleable commodity in times of absolute disaster The vulnerability of their occupation makes them see wealth as tied to the means of production rather than the stream of income

An all female focus group in Orange Bay associated economic well-being with ownership of both human capital, through educational attainment and, like the fishermen, ownership of productive assets such as hairdressing shops, bars and small restaurants Interestingly, however, though three of the 17 participating in semi-structured interviews derived income in this way, they did not have security of land tenure on their properties Wealth was also associated with physical mobility, particularly the ability to travel outside Jamaica

Given these findings, relative household wealth was defined by assets rather than income categories—through a comparison of the physical assets owned against the assets of those they perceived to be better off Of the four household systems defined below, fishermen identified categories (b) but mainly (c), as the household type which best described their wealth levels These analyses were supported by transects and comparative analysis across the six communities visited

a) Multi-roomed concrete homes with fenced yards, tiled roofs, electric appliances (refrigerators, cookers, televisions, VCRs and stereos), indoor plumbing, flush toilets, expensive furnishings and automobiles Occupants do not derive income from fishing

b) 1-2 room homes, electricity for lighting only, kerosene stove, limited but average quality furnishings, well constructed pit latrines, small yards, bicycles and motorbikes for transport Occupants normally have boats with engines

c) Homes partially constructed in a "piece by piece" fashion from roughly hewn unpainted boards, one or two rooms, sparse furnishings, no electricity, water taps in the yard (except in the case of the Little Bay communities who purchase water from vendors at J$100 for 40 gallons), poor quality pit latrines, outdoor kitchens Generally small canoe boats without engines

d) One-roomed wooden houses, hand-dug pit latrines, communal standpipes, wood fire, lamps, "poor man's concrete" (marl & lime mix), zinc roofing, substandard self-constructed furnishings

Categories (a) and (d) are in a minority in the communities investigated Although most fishermen identify themselves under groups (b) and (c), many feel that their aspirations to the wealth level associated with category (a) can be achieved if their vessels and marketing outlets are improved Most fisher families have no transportation and travel on foot or use local taxis Few have cars (between 6-7 in each community) and a small number own bicycles and motorbikes

All fishing communities are concerned that the lack of sanitary facilities (dry toilets), poor roads (in remote communities such as Little Bay), and inadequate shelter (from which to sell fish, store equipment, and take refuge from rain) conspire to prevent effective marketing beyond their immediate community Fishermen were also concerned that human and other waste contaminates the sea and presents a potential health hazard, due to the lack of sanitary facilities and waste collection

2 4 8 Credit

The fishermen see upgrading fishing equipment as a priority to improving the catch, although the availability of credit is a major constraint[9] The Fisheries Division formerly assisted licensed fishermen by offering 50 percent credit on the purchase of boat engines This scheme no longer functions as Fisheries were unable to retrieve outstanding loan repayments The problem of access to credit is a major hindrance to fishing activities and solutions sought should be creative

2 4 9 Supplementary Livelihood Strategies

For the Negril fisher families, fishing is one component of a complex system involving elements of agriculture, informal vending, tourism, remittances from abroad, and part-time work on the fringes of the formal economy (e g taxi driving, construction) In most cases work patterns

[9] It is not uncommon for fishermen anywhere in response to declining catches to prioritize the upgrading of fishing equipment and gear to allow them to travel further This is not a panacea for the Negril fisher families however, in view of the over fished condition of the fishing banks much further out to which they would travel if they had the gear

reflect an almost equal division between land-based and sea-based activities The majority of fishermen's marine activities are limited to setting fish traps As one fisherman observed, the advantage of using fish traps is that "while we are sleeping, they are working" However, fishermen who do line or net fishing are likely to spend more time at sea Preferences for day or night fishing also dictate the amount of time fishermen are occupied in land-based employment

The most common supplemental form of income for the fishermen is small-scale farming of yam, cassava, bananas, plantain, potato, cocoa, pumpkin and melon Up to 50 percent of these provisions are sold locally and the rest consumed by family and friends No-one interviewed felt that expansion of farming activities was possible as crops are planted on small plots, land is expensive, and fishermen are unable to compete with locally-based large-scale farming *Ganja* is cultivated by almost all fisher families and contributes significantly to income levels, however several communities requested that details of this activity not be exposed Only 10 percent of fishermen are involved in tourism-related activities and these are limited to offering boat trips on an *ad hoc* basis to passing tourists or relatives of friends visiting from overseas One fisherman from the S Negril River fishing community has been forced to abandon his eco-boat tours as insurance coverage costs J$56,000 annually and he could not compete effectively with the well-established hoteliers Informal tourism initiatives are not seen as effective in increasing income Mariculture activities are being carried out at Little Bay—only two fishermen in the community oversee this project

2 4 10 Seasonality

Fishermen themselves divided the year into three seasons in Little Bay and two in S Negril River and Orange Bay, reflecting the fact that their calendar is weather dependent The main fishing season is between May and October but all seasons are characterized by uncertainty This unpredictability adds weight to the fishermen's assertions that income levels are impossible to gauge with accuracy and that land-based activities form a vital and intimately linked component of broad based livelihood strategies which include fishing

2 4 11 Reduction in Fish Catch

The results of time lines, pairwise ranking and scoring exercises identified four key factors perceived to be responsible for the general decline in the fish population over the last decade

- The destruction of the coral reef by Hurricane Gilbert in 1988 is generally accepted as the first indication of dwindling fish catches The communities of Little Bay report a 20 percent reduction of coral reef cover and a significant depletion of juvenile fish stocks

- The proliferation of fishermen from communities outside Negril (Montego Bay, Lucea, Savannah-La-Mar, Great Bay, Black River and Parotee) using the fishing grounds within the Negril Watershed as alternative fishing sites The fishermen believe that over fishing of the Pedro Bank (from Jamaican fishing communities and

those located as far away as Honduras) has put pressure on fisherman to utilize the resources of less burdened fishing grounds

Though fishermen were cognizant of the burden external fishermen (with bigger and speedier boats) placed on their local fishing grounds, they failed to appreciate that their desire for improved fishing technology would result in burdening fishing grounds elsewhere More importantly, the introduction of new or improved technology can affect the distribution of wealth in a situation where the same fishing ground is used by groups employing different fishing gears for the same or different resources

- Destructive fishing techniques such as seine net, spear and dynamiting which displace fishing populations and destroy the coral reef have also had a significant impact on the size of the fish catch over the last 3 years Though spear fishing is still popular with young men (between the ages of 17 and 25 and who comprise about 20 percent of the fishing population), spear fishermen from Lucea, in organized groups of up to 20, now regularly use the fishing communities as a fishing base upward of four days a week, both morning and night Fishermen report that the reef from Salmon Point is "screaming" from the destruction caused by dynamiting Three perpetrators were apprehended in July in a collaboration between NCRPS and the Negril Police but dynamiting still continues Only one seine net fishermen was identified working out of the S Negril River who confessed to complaints against him by other fishermen from the area His justification for continuing was to ensure the health of his family, which illustrates the intensity of the conflict between local economic needs and the wider ecosystem

- Coastal tourism-related development is reported as one of the reasons for reduction in catch size Fishermen believe the effluent from hotels and poor sewage facilities kill the reef However, only key informants identified agro-chemical runoff from fertilizers and waste from processing factories and linked this to rapid growth of algae

2 4 12 Perceptions of Institutional Representation

Information derived from fishermen on institutional representation was elicited in three stages In most communities, people recognized five key institutions as having influence over the management of their activities - NCRPS, NEPT, the NFC, the Fisheries Division, and the Urban Development Corporation (UDC) Venn diagrams were used to elicit fishermen's perspectives on the significance and impact of the roles that these institutions have on their lives as well as forms of assistance offered The final stage examined the degree of influence fishermen have in the decision-making process and agendas of these institutions, and ways in which they could be improved Each institution is dealt with separately below, and an example of the process can be found in Annex C

- ***The fishing cooperative (NFC)***

The majority of fisher families feel that the cooperative does not represent their concerns The RRAs identified 20 registered members and all expressed disappointment that the cooperative agenda (of which few are fully cognizant) reflects the interests of the cooperative leaders, not the membership at large Specifically, fishermen were disappointed that securing land tenure for a building from which to operate remains unsuccessful after five years[10] Fishermen see the major benefit of the co-op as providing concessionary-rate gear, but to date this has not been established and fishermen continue to purchase equipment from distributors in Whitehouse, Kingston and Savannah-La-Mar However, registered fishermen continue to support the cooperative in the hope that land will be secured shortly Fisher families at Green Island set up a fishing cooperative in the mid-70's which failed due to internal wrangling and poor representation

Fisher families are keen to be involved in the selection of new cooperative representatives in key positions As well as focusing on some of the issues forwarded by the co-op agenda, fishermen want the cooperative to garner government support in order to facilitate infrastructural development as poor quality sales outlets and non-existent sanitary facilities presently undermine attempts to expand the range of the customer base Large hotel owners and tourist outlets buy fish from Whitehouse

Fishermen want the cooperative to collaborate with the Fisheries Division and Protected Area managers to prohibit external fishermen from using seine nets in the Negril Watershed They also want to secure ownership to local aquatic resources in order to control the number and frequency of spear fishermen from Lucea encroaching on their waters

- ***Protected area and marine park managers***

Communities displayed a greater understanding of the conservation issues related to sustainable fishing practices than of the role played by Marine Park and Protected Area managers in Negril The vast majority of fishermen were unable to distinguish between the Negril Coral Reef Preservation Society (NCRPS) and the Negril Area Environmental Protection Trust (NEPT), some perceiving them as one entity Apart from key informants, who represent their respective communities on the NFC board, participants were unaware that the cooperative represented their interests through the NEPT board

- ***Fishermen's perceptions of the effects of marine park regulations***

In the final part of the analysis fishermen were divided into two groups to contemplate positive and negative effects of proposed marine park restrictions which will prohibit fishing activity within one mile of the shoreline The 70 percent of fishermen in Little Bay who have canoe boats

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[10] This problem was apparently resolved during the time period of the field work by the study team—the land has been deeded to the fishermen represented by NFC

without engines, feel their fishing activity will be severely reduced by the Protected Area as they presently fish only 400 yards from the shoreline where the drop-off descends to approximately 200 feet Conversely, the Orange Bay and Green Island communities are likely to be restricted under marine park regulations to fishing within one mile of the shore, but the drop-off depth of 200 feet is at a greater distance from the shore and a higher percentage of fishermen own engines It appears that fishing activities closest to shore will be most affected by the proposed Protected Area, and this is likely to impact most on spear fishermen and canoe owners, the most vulnerable groups in economic terms

Fishermen over 40 years old, who represent more than 50 percent of all community members normally fish in the shallows in canoes They complained that they were entrenched fishermen, reluctant to alter their current livelihood practices It was suggested by older fishermen at Orange Bay that restrictions be placed on men under 50 and special licences issued to those over 40 to allow them to continue their current activities

Fishermen examining the benefits of fishing restrictions feel it would protect juvenile and breeding fish which, in turn, would increase future supply while simultaneously prohibiting spear fishermen from destroying the reef and stealing catch from fish traps However, they suggested that these benefits are likely only if strict compliance with Protected Area regulations are enforced In the spirit of 'Participatory Monitoring', they are keen to be involved in enforcement because they clearly see the benefits to themselves in doing so At a minimum, this is likely to reduce the impact of the gangs of outsiders, even if people do not inform on others from the same community Fishermen responded positively to efforts made by the Marine Park managers in constructing artificial reefs and fish aggregating devices, and mariculture activities such as sea moss cultivation which may provide additional employment for displaced fishermen Several fishermen are currently employed on a part-time basis supporting marine park initiatives that ultimately contribute to the sustainability of the fishing effort generally

2 5 Tourists

More than 1 1 million tourists visited Jamaica in 1996 (not counting the cruise ship visits), staying an average of some 11 nights per tourist As indicated in Table 2 2, the biggest market share by far are tourists from the US (nearly 67 percent), followed by a distant second, UK and Europe, (nearly 18 percent) Canada, Latin America, Japan, and other comprise the remaining sources of origin for the tourists visiting Jamaica, associated with relatively low market shares Visitation during the low season, (January through April) is only 35 percent of the total

Table 2 2 High vs Low Season Tourism in Jamaica in 1996 by Source of Origin

Seasons	US	Canada	U K & Europe	Latin America	Japan	Other	Total
Lo season Jan Apr	273 459	46 532	62 003	7 409	7 638	11 353	408 394
Hi season May Dec	500 387	55 683	146 363	11,319	14 642	25 661	754 055
Total	773 846	102 215	208 366	18 728	22 280	37 014	1 162 449
Percent	66 6%	8 8%	17 9%	1 6%	1 9%	3 2%	100 0%

Source Jamaica Tourist Board, Annual Travel Statistics, 1996

2 6 Agriculture

The Negril Development Plan (1994) indicated that, in 1982, almost half of the male labor force in Hanover and Westmoreland was involved in the agricultural sector, however no statistics for the current period were available Farming takes place mainly along the southern, eastern and northern edges of the Morass and along the foothills of the Fish River Fruits, vegetables and yams are the major crops grown by small scale farmers for the local market Small herds of goats and cattle are also grazed in private pastures or adjacent public lands Ganja is known to be grown in this area

2 7 Legal and Institutional Developments

2 7 1 Policy

The Jamaica National Environmental Action Plan (1994) had set out policy objectives for the management of environmental resources which, *inter alia*, aim to a) maintain the marine environment and the territorial waters at a quality appropriate for the designated use of ecosystem requirements, b) minimize the impact of natural hazards and other environmental hazards on natural systems, c) create attitudes and behavior which are responsible and oriented to action in environmental protection and the sustainable use of natural resources

2 7 2 Key Institutions

Responsibility for the management of coastal resources resides primarily with two key agencies, namely a) the Fisheries Division of the Ministry of Agriculture and Mining, and b) the NRCA The Fisheries Division is responsible for the management of marine and inland fisheries but its effectiveness is constrained due to inadequate staffing, and the lack of a clear mandate and support from within government (Fisheries Division, 1997) The NRCA has the legal mandate for the management of coastal resources which include the powers for protection of flora and fauna, the establishment of national parks, the setting of standards for water quality, requirement of environmental impact assessments where proposed activities may have a negative impact on the environment, and approval of all plans for the development of beaches The NRCA may also delegate the responsibility for management of a resource or an area to another agency or NGO

The Negril Protection Area as defined in the Negril and Green Island Area Environmental Protection Plan (1995) will soon be declared and its management is expected to be delegated to the Negril Area Environmental Trust (NEPT) NEPT was set up in 1994 and is governed by a Board of Directors which includes representatives from the local community, Forestry and Soil Conservation Department, Jamaica Constabulary Force, Jamaica Hotel and Tourism Association, National Water Commission, NRCA, Negril Area Schools, Negril Chamber of Commerce, Negril Coral Reef Preservation Society, Craft vendors Association, Negril Green Island Area Local Planning Authority, Negril Resort Board, Urban Development Corporation, Westmoreland Health Department and Whitehall Citizens Association

A Negril Marine Park has been proposed and its establishment has been actively promoted by the NCRPS since 1995 It is likely that official delegation of responsibility for management of the marine park will be given to this NGO when the park is legally declared a protected area The NCRPS already conducts patrols in the proposed a marine park, maintenance of mooring buoys, education and training of school children and resource users, and data collection

Administration in the Negril area for local development also falls under the jurisdiction of the Negril Green Island Planning Authority (development control), Urban Development Corporation (land development and maintenance), Westmoreland Parish Council (responsibility for public services) and Hanover Parish Council (responsibility for public services) Financial constraints and inadequate capacity have restricted the effectiveness of these agencies in ensuring desirable levels of services and development

2 7 3 Relevant Legislation

There are many Acts and Regulations which enable state agencies to undertake some measure of control in the use of coastal resources, however, some of these Acts are outdated and are presently being revised Enforcement of regulations has generally been weak, due to limited manpower, equipment and insufficient political will, but collaborative arrangements among several agencies and NGOs are being used to address this deficiency The following list of legislative instruments is not exhaustive but is considered relevant to coastal resources management

Beach Control Act 1945
Exclusive Economic Zone Act 1991
Fishing Industry Regulations 1976
Fishing Industry Act 1975
Morant and Pedro Cays Act 1907
Natural Resources (National Parks) Regulations 1993
NRCA Act 1991
Public Health Act 1974
Town and Country Planning Act
Urban Development Corporation Act 1968
Watershed Protection Act 1963
Wildlife Protection Act 1945

3 FISHERIES MANAGEMENT ALTERNATIVES

3 1 Introduction

The Jamaican fisheries are characterized by increasing fishing effort, overcapitalization, declining catch rates, declining real income to fisher families, negative trends in species composition and value, reduction in fish mean size, and increasing conflict among fishermen, which may be attributed to a lack of proper plans to provide for effective management and controlled expansion of the fishing effort (Aiken and Haughton, 1991) The objective or obligations which management should address must be made clear Usually, fisheries management in the Caribbean has been primarily concerned with stock assessment and control of fishing effort Some islands have also initiated attempts at stock replenishment for reef fisheries on a limited scale

3 2 Common Control Mechanisms

Since the fisheries in Negril is artisanal in nature, the foregoing description will not consider control mechanisms for large scale commercial fishing operations Once the management objectives have been established there are six basic approaches which have been used in reef fishery These are described below

3 2 1 Zoning

Many options exist for the regulation of human activities in coral reefs, typically, these involve the setting up of a marine park or marine reserve with areas demarcated as anchorage, multiple use (fishing and diving), recreational diving (no fishing, no anchoring), and all purpose recreational zone, as is found in Saba, Netherlands Antilles In St Lucia and Dominica a fish nursery/sanctuary was additionally designated and fishing was prohibited in this area In both the Saba Marine Park and the Hol Chan Marine Reserve (Belize), the standing stocks of fish had almost doubled over a period of four years (Polunin and Roberts, 1993)[11]

3 2 2 Closure

Closure for part of the year, usually during the breeding season of selected valuable species, such as, lobster, has been operational for many years in many Caribbean islands Generally, lobster catching is prohibited between April and June of each year, and harvesting of the white-spined sea urchin (*Tripneustes* sp) is closed from January to August of each year Additionally, the closing and opening of parts of the fishery for periods greater than a year in order to allow alternating periods of harvest and recovery from harvest, has been tried in St Lucia This became necessary when the seaegg (white-spined sea urchin) was over fished and harvesting was stopped for a period of two

[11] Any implications of the current proposed zoning plan for the Park were not considered here because it would only be conjecture In fact the plan will probably go through additional iterations in the near future as the Park designation progresses towards reality

years during the early 1990's to allow recovery and formulation of a revised harvesting strategy This was also done in Barbados between 1987 and 1989 Permanent closures of small areas from fishing has also been utilized in zoning of marine reserves

3 2 3 Quota for Harvesting

Determining an allowable level of harvest within a specified season and prohibiting harvest once that level has been reached can be used to ensure that adequate stock is available for replenishment This approach depends on monitoring of stock size and site specific information on the biology of the target species for guidance in determining the quota This method has not yet been used in the Caribbean for coral reef species

3 2 4 Equipment Restrictions

Prohibiting or limiting the types of equipment or fishing methods have been used with varying degrees of success in many islands Generally, fishing regulations have specified the minimum mesh size for certain types of nets or seines, and the banning of toxic chemicals and explosives for fishing Regulations for marine protected areas in Saba, Bonaire, St Lucia and Tobago have prohibited the use of spearguns

3 2 5 Species Size Limits

Establishing the minimum and maximum size limits for allowable harvest of selected species in order to protect breeding stocks is a common strategy However, this approach requires information from historic data collection on distribution and abundance, as well as knowledge of the biology for the target species In the Caribbean, some states have set a minimum size of the carapace (7 6 cm) for the harvesting of mature lobsters, and have determined that only adult conch with shell length not less than 22 cm or only conch with shells having a flared lip should be harvested Additionally, lobsters which are moulting or berried (egg laden) are protected from capture by legislation

3 2 6 Registration and Licensing

Registration of fishermen and their boats is a widespread practice in the Caribbean which facilitates governments administration of the industry Registered fishermen are allowed access to subsidized fuel, duty free concession on prescribed equipment and preferential access to training opportunities Registration allows for the monitoring of activities of fishermen and can facilitate enforcement procedures Fishing licences are also granted which may or may not carry specific restrictions related to fishing area, gear and vessel type, and permitted species for harvesting

3 3 Control Mechanisms Used in Jamaica (Artisinal Fishery)

3 3 1 Zoning

The Montego Bay Marine Park is the only legally declared marine protected area in Jamaica Several use zones were designated and fishing is prohibited in selected zones The offshore Pedro and Morant Banks are used almost exclusively for fishing

3 3 2 Closure

There is a closed season for lobster from 1st April until 30th June, and for conch from 1st July until 30th October of each year Permanent closures of selected areas to fishing can be declared by the Minister as a Fish Sanctuary under article 18 of the Fishing Industry Act

3 3 3 Equipment Restriction

The Fishing Industry Regulations prohibits the use of fry net or any shove net of any length exceeding 3 66 meters Further, the regulations also specifies the minimum mesh size for beach seines as 3 17 cm at the bunt, 4 43 cm at the corners, and 5 08 cm at the wings The size of mesh for fish pots/traps is not specified However, researchers in Jamaica have found that use of fish traps made with 3 81 cm (1 5") wire mesh in Discovery Bay helped in reducing the fishing pressure and increasing the yields in that area (Sary, Oxenford and Woodley, in press) Traditionally, traps have been made with mesh of 3 18 cm (1 25"), and catches much more juvenile fishes than traps made with larger mesh Some fishermen in Montego Bay are also using traps made with the larger mesh The Montego Bay Marine Park has also banned the use of spearguns within its boundaries The use of dynamite, poisons and other noxious substances for fishing is prohibited in Jamaica

3 3 4 Species Size Limits

The only size restriction in the regulations prohibits the catching or destruction of any spiny lobster with a carapace of less than 7 62 cm in length It is also illegal to catch and bring ashore, or destroy any berried lobster

3 3 5 Registration and Licensing

Currently all fishermen are required to be registered and licenced Operational and socio-economic information is collected at the time of registration Licencing is free of cost to the fishermen and must be done annually Subsidies on fuel and duty free concessions on equipment are available

3 3 6 Proposed Developments

The Fisheries Department has prepared a draft Plan for Managing the Marine Fisheries of Jamaica (1997) which is currently out for review and comments Action plans have been prepared for shallow shelf and reef fishes, deep slope fishes, coastal pelagics, large pelagics, lobster, conch and shrimp A revised Fishing Industry Bill has been drafted and is being reviewed by several interest groups

The South Coast Conservation Foundation has prepared for the NRCA, a draft Provisional Management Plan for the Portland Bight Sustainable Development Area 1997-2000 (1996) This plan contains a section on fisheries management which emphasizes community participation and collaborative management and includes details on the formation of a Fisher's Association, a Fisheries Management Council, and suggests a system of regulations for control of the fishery within its jurisdiction A method for limiting the entry of fishers and boats into the fishery is proposed which may be workable in Negril

4 ALTERNATIVE LIVELIHOOD OPTIONS FINANCIAL ANALYSIS

4 1 Introduction

The financial analyses of three different alternative livelihood options are presented in this section The analyses are anchored to specific sets of assumptions for each intervention and to specific configurations of the interventions that will generate corresponding streams of costs and benefits Both the assumptions and configurations can, of course, be changed in the analytical framework which will then generate different results It is important to note that the alternatives analyzed do not necessarily encompass all of the priorities expressed by the fisher families, nor do they purport to fully solve the fisher families' economic livelihood problems in view of the decline in catches over the past several years The results of the analyses presented in this section can only be regarded as preliminary since they are based on assumptions that are not well documented in the literature—they were largely determined on the basis of field interviews and estimations of prices and costs as observed and noted by the team during the field work The main purpose of the analysis is to determine if the proposed interventions are financially feasible from the perspective of the Negril fisher families in a general sense, and, if so, give reason for USAID/Jamaica to pursue the matter further in-depth in the planning for the DEMO Project extension

4 2 The Alternatives

The three alternative livelihood options analyzed are a) **fish farming (aquaculture)**, b) **seamoss farming (mariculture)**, and c) **sustainable tourism** These three options were consistently favored (or least disfavored) among the fishermen interviewed The alternatives were first presented to the team by the fishermen cooperative management structure (but not necessarily, at that point, reflecting the priorities of the fisher families at large) When these options where brought up for discussion during meetings with fishermen on the different beaches, they were news to some, rejected as unworkable by others, and endorsed by yet others after the social and economic complexities of each option had been thoroughly discussed Each intervention is briefly described below

4 2 1 Fish Farming Aquaculture

Fresh water fish farming (aquaculture) is viewed by some fisher families as a temporary measure— an income-earning opportunity made available while giving the marine fisheries a period of rest and restoration to eventually return to higher levels of productivity Other fisher families are interested in aquaculture because they are familiar with fish handling and fish markets and aquaculture would afford them the opportunity remain independent operators Some fisher families are not interested in aquaculture, however, because " they are fishermen and not farmers " The option is probably more attractive to younger fishermen who may be more prone to accept alternative livelihood options than the older fishermen It is also an attractive option in view of the fact that the Government of Jamaica (GOJ) is promoting aquaculture by making suitable land available under leasing arrangements through the National Investment Bank of Jamaica (NIBJ) to qualified applicants In addition, the Fish Rural Aquatech Co (headed by Mr Maurice Reynolds) in Meylersfield

(approximately ½ hour travel distance from Negril) is also conducting technical training in four to six-month long certificate programs aimed at increasing the supply of qualified aquaculture technicians The current program has 150 trainees who will either become aquaculturists themselves or technicians in aquaculture operations The Negril fisher families would be well advised to take advantage of this training opportunity which also includes a small stipend from the Social Development Communication (SDC—an arm of the GOJ) for the participants while in training In addition, the program is also set up to provide low cost loans to the participants to set up operations after completing the training program

The major limiting factors are the availability of clean fresh water and land The ideal size of operation is in the order of five acres and several ponds because the number of workers needed for only one pond on one acre is the same number needed for up to five acres and several ponds Relatively few fisher families living near water sources and eligible land, therefore, will be eligible for this intervention

The intervention consists of cash and time investments Cash investments are needed for the construction of the pond(s) and the procurement of fingerlings Recurrent cash investments include feed and the payroll for the workers

4 2 2 Seamoss Farming Mariculture

Seamoss (irishmoss) farming is technically feasible in the Negril area because of an abundance of reasonably well protected and suitable sites along the coastline, particularly at Homer's Cove, Little Bay, Orange Bay, Samuels Bay, and possibly Green Island Harbor In Caribbean waters there are some 10 species of seaweed that can used for food and for which there are markets (Canari, 1997) The traditional use of the two most popular species—*Gracilaria* (producing agar), and *Eucheuma* (producing carrageenan)—is in the preparation of milk-based drinks and puddings

Mariculture of this marine algae typically involves the procurement of planting material, usually harvesting plants from the wild, or through importation, splicing the planting material through a multifilament rope supported by floatation devices usually empty, sealed plastic bottles, and anchoring the rope at both ends with used automobile tires filled with cement This whole assembly is sited in the sea in an area of calm water about 1-1 5 meters deep The plant grows outward from the rope suspended in the sea Depending on growing conditions, the seamoss can be harvested between 6-8 weeks after planting During harvesting the plant is cut back to within 2 cm from the rope where it is allowed to regenerate vegetatively

The investments required consist of time and some cash for materials Cash is needed for the procurement of rope (three strands polypropylene rope, 3/4" thick), cement for the tire anchors, and a simple shed for the drying and storage operations The time investments include setting the tire anchors and outplanting plus the recurrent costs of maintaining the installation, and harvesting and processing labor

4 2 3 Sustainable Tourism

With respect to tapping into the booming tourist market in Negril, the fisher families have essentially two options a) compete for the tourists who stay at other hotels in Negril for certain activities such as guided diving, snorkeling, and glass bottom boat viewing (of the coral reefs) excursions, or b) compete with the other hotels with hotel or guest house facilities including full-fledged all-inclusive packages While the former will cost much less (retrofit some of the fishing vessels to accommodate tourists, and procuring a glass bottom boat, etc), the competition is very stiff from the many large hotels in the area who all have glass bottom boats and include such excursions in their all-inclusive packages The latter option will involve major investments in tourism infrastructure, including also the procurement of a glass bottom boat and vehicles to transport tourists by road

The analysis presented below is for the latter option in view of the fact that land with beach access in prime, yet undeveloped areas, has now been officially granted to the Negril fishermen These prime parcels of land offer the opportunity to integrate all functions envisioned by the fishermens' cooperative—central base of operations for the fishermen, repair facilities for vessels and equipment, and a base from where to carry out tourism activities The niche for the Negril fishermen in the tourism market (as expressed by the cooperative management) is to blend the culture and traditional ways of life of the fishing communities with the regular beach and water sports-related activities offered by other hotels in the area, plus offer an ecological approach to tourism marketing, i e , catering to tourists that are ecologically more aware The opportunity is present, therefore, to offer all-inclusive tourism packages that are uniquely different from those offered by others The packages could offer a) all "sun and surf" services, b) exposure to cultural and traditional ways of life provided in accommodations based on sound ecological principles (as outlined in the Environmental Code of Conduct for Hotels, 1997), and c) excursions with an ecological orientation (such as to the Royal Palm Grove Park—a magnificent and ecologically fragile tourism destination only a few minutes up river from Negril town) Other ecologically and culturally oriented excursion possibilities are well documented in the Gaudet report (1997) on eco-tourism

The proposed tourism intervention is substantially more complex to analyze than the others because it involves not only the fisher families, but tourism operators as well All involved must be assured of the prospect of reasonable profits, otherwise the tour packages cannot be sold A small 10 to 12 room guest house facility is envisioned, constructed in accordance with traditional and cultural esthetics, yet providing every comfort offered by other hotels in the area In addition to the main guest house building, the site will also be used to provide the basic necessities for the fishermen—a repair facility for the boats and outboard motors, the cooperation offices, and sales outlets for fishing gear and accessories

4 3 Financial Analysis Assumptions

The assumptions used in analyses for the three interventions are summarized in Tables 4 1 - 4 10 below The shaded areas in the tables indicate input assumptions—variables that can be changed

to generate different cost and benefit streams at will The input assumptions are also described in detail below

4 3 1 Discount, Cost and Price Appreciation Rates, and Labor Costs

In Table 4 1, the discount rate is a key variable as it reflects the rate of return entrepreneurs can reasonably expect to earn from alternative investments associated with a similar level of risk In most economic and financial analyses carried out for donor-funded projects, the discount rate typically chosen is somewhere between 10 and 15 percent Since the analyses are carried out from the perspective of the Negril fisher families, however, it is prudent to account for the financial realities they are likely to encounter when they make their investments Jamaica's rate of inflation has been approximately 23 percent per year since 1989 The average nominal rate paid for medium-term loans (6 to 12 months) in the commercial banks is 55 percent (Planning Institute of Jamaica, 1995) When adjusting for inflation, the **real** interest rate paid for such loans is approximately 25 percent[12] For purposes of the analysis, therefore, a conservative 25-percent real discount rate is assumed for the aquaculture and mariculture interventions[13] For the much more capital-intensive tourism intervention, however, a lower real discount rate of 15 percent is assumed because the borrower is an institution (the fishermens' cooperative), not an individual, hence the lender's level of risk is perceived to be lower It is also possible that this intervention would qualify for funding with softer loans through the international development banks

For the base case (the assumptions used for the analyses presented in the report) a constant (zero) real cost and price appreciation rates is assumed for lack of reliable data to determine if real costs increase faster or slower than the real benefits (prices) over time When and if such data becomes available, however, the analytical framework developed for this study can easily accommodate any changes in the assumptions

The opportunity cost of time for the Negril fisher families is also difficult to determine in the absence of any documented statistics on fisher family incomes Annual incomes are determined by multiplying the volume of fish caught per year by the average price for the fish sold in the local markets less the costs of catching the fish Based on detailed interviews with the fishermen, they will typically spend three days per week fishing, or roughly 150 days per year accounting for bad weather Some years the fishing effort is less, other years it is more On very good days the catch for a fisherman with 10 to 12 traps may be as high as 20 lbs of fish sold at an average price of J$75 per lb,

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[12] Note that this is a real as opposed to a nominal interest rate—the influence of inflation has been removed

[13] The discount rate assumption is largely a matter of educated judgment based on the logic expressed on lending and savings rates The idea is to justify a rate substantially higher than the 10- to 15-percent rate most often used since the target beneficiaries are likely to be risk averters (i e , they need the assurance of very attractive rates of return to be enticed to switch from the occupation of fishing to something else)

generating a gross income as high as J$1,500 per day (for perhaps as many as 40 days per year)[14] The average catch for the remaining 110 days is a more modest J$450 per day or less—up to 6 lbs per day The total gross income, therefore is estimated at roughly J$110,000 J per year, or equivalent to nearly J$425 per day assuming a 260-day work year (365 days less weekends) If the cost of the fishing effort is 60 percent (estimated in consultation with the fishermen), the average daily opportunity cost of time is roughly J$250[15] which is assumed for purposes for the analyses of the aquaculture and mariculture interventions[16] This would reflect the approximate midpoint of annual incomes for fisher families owning one 16-foot canoe without an engine and 12 traps (earning an estimated net J$40,000 per year), and owning one 16-foot canoe with an engine with 12 traps who also does some trolling (earning an estimated net J$100,000 per year) The assumed labor costs for the tourism intervention are discussed in Section 4 4 4 below

Table 4 1 Discount, Cost and Price Appreciation Rates, Opportunity Cost of Time ($J)

Variables	Aquaculture	Mariculture	Tourism
Discount rate	25 0%	25 0%	15 0%
Cost appreciation rate	0 0%	0 0%	0 0%
Benefit (price) appreciation rate	0 0%	0 0%	0 0%
Labor cost (opportunity cost of time) $J	250	250	NA

4 3 2 Fish Farming Aquaculture

The assumptions pertaining to the aquaculture operation are summarized in Table 4 2 Based on the interviews with aquaculture specialists, the best size of pond for a one-pond operation is slightly less than one acre, or as assumed here, 4000 square meters The construction of the pond is quickly done with a bulldozer on land (preferably with clay subsoil which holds water much better than porous soils) approximately five to six feet deep, with a very gentle slope from one end to the other The construction cost is assumed to be J$110,000, including all plumbing needed for filling and draining the pond after every harvest Once built, the pond is stocked with 8,000 male only

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[14] The majority of fishermen in the Negril area are trap fishermen only for lack of equipment and gear to do much deep sea fishing The majority of fishermen who have engines will do some trolling during the September - November period for larger and more valuable fish The assumptions made for the opportunity cost of time reflect mostly trap fishing only some deep sea fishing

[15] This accounts for fuel costs procurement and replacement costs of bait and lines construction, maintenance and replacement costs of the fish traps and wear and tear of the boats, outboard motors and gear

[16] The J$250 per day labor cost of time is only a rough estimate As was well documented in the RRA (Section 2 above) fisher families are reluctant to or cannot provide reliable information on their annual incomes Nevertheless an estimate of the labor costs for purposes of the analysis is essential as was derived here The J$250 estimate is also varied with other costs in the sensitivity analysis in Section 5 below It is also emphasized that the labor cost estimate reflects the **opportunity cost of time** not the current wage scales in Jamaica This is simply a measure of of the monetary value given up from fishing by spending time on aquaculture or seamoss operations instead In this context the J$250 is a reasonable estimate even if it is lower that the minimum labor wage scale for unskilled workers in Jamaica

fingerlings purchased for J$3 00 each[17] It is anticipated that the pond will employ five workers to maintain and operate the facility (including relief workers, some performing guard services and other tasks) Each worker is assumed to be salaried at the assumed opportunity cost of time of J$250 per day for 260 days per year An annual J$15,000 cost for leasing the land is assumed

Table 4 2 Input Assumptions, Aquaculture

Construction per pond occurs in year	1	Target for development acres	50
Average pond size measured in square meters	4000	Max no of years allowed to reach target	5
Const cost (bulldozer) incl plumbing $ J	110000	Pond operation labor/year (no of days)	260
Cost per fingerling ($ J)	3	Labor cost per day $ J	250
No fingerlings bought per m2 of pond	1 8	No workers per exploitation	5
Fish yield/weight (lbs) per fingerling at harvest	0 75	Survival rate each harvest	80 0%
No production cycles/year	2	Price per lb for fish sold ($J)	70
No production cycles in year of construction	1	Feed cost per lb $ J	8 00
Feed lbs of feed per pound of flesh	2	No times per year to rent pump	2
Rental of pump for drainage operations $ J	4000	Land lease J$ per acre per year	15000

Once in operation, the pond will produce an average of 0 75 pounds of flesh per fingerling per four to six months, accounting for an assumed survival rate of 80 percent Under normal and efficient operation, harvesting can occur up to three times per year—only two harvests per year are assumed for purposes of the analysis In year one, only one harvest is assumed to allow for the construction period, problems occurring during startup for lack of familiarity with the aquaculture operations, and other problems Once up and running, however, a steady volume of fish can be counted on regularly at least twice per year It is further assumed that two pounds of feed will, at a cost of J$8 00 per pound, be needed to produce the 0 75 lbs of flesh[18] Finally, it is assumed that the operator chooses to rent a pump for the filling and drainage operations required after each harvest The assumed rental cost is J$4,000 per harvest cycle

4 3 3 Seamoss Farming Mariculture

The input assumptions for the seamoss farming intervention are summarized in Table 4 3 The capital costs, all incurred in year 1, include a) 10 lines of rope, 5 meters in length, spaced roughly 1 5 meter apart, b) 10 discarded tires (procured at zero cost) used as anchors, filled with c) cement (0 5 bags per anchor mixed with gravel and sand), d) plastic bags for the processing of the seamoss after each harvest, e) a shed to properly shelter the seamoss after it is dry, f) procurement of the seamoss planting materials (cuttings), and g) several empty plastic bottles used as floaters (procured free of charge) Labor costs are expended for the preparation of the tire anchors, outplanting, harvesting and processing, and daily maintenance of the lines once installed

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[17] Genetically superior fingerlings are available for this price from the aquaculture facility in Meylersfield

[18] Since the fish will attain a weight of 0 75 lbs in four to six months note that the cost of the feed will be significantly less during the earlier months and higher closer to harvest

As indicated in the table, a modest growth rate of moss of 0 25 lbs per meter per week (dried) is assumed, which is lower than the growth rate expected for a properly managed seamoss operation (see Canari, 1997) At this growth rate, the exploitation will produce some 650 pounds of seamoss per year, or approximately 75 pound of moss per harvest (six harvests per year are assumed)

Table 4 3 Input Assumptions, Seamoss Farming

Capital costs all incurred year	1	Construction of drying shed & mesh for drying			20000
No lines per exploitation	10	Length per line (meters)	5	Discount rate	25 0%
Tire anchors no needed	10	Cement bags per anchor	0 5	Price/bag	280
Rope (3/4 diameter) $ J cost/lb	125	$J # lbs per line			2
Provision for rope replacement per year	25%	No bags per lot	50	bags needed	25
Plastic bags for bleaching $J per lot	2400	No bags per lot	100	bags needed	300
Plastic bags for marketing $J per lot	1200	Maintenance hours per day			2
Man days to prepare tire anchors	4	Man days to harvest process & market each harvest			6
Outplanting (seeding ropes)	3	Procurement of planting material			3000
No harvests per year	6	Opportunity cost of time J$ per day			250
Production lbs per meter per week	0 25	Selling price per pound ($J)			42
Fishermen population	500	Target for seamoss farming participation			10 0%
Target to be reached by year	10				

The assumed selling price for the dried moss is J$42 which is, in this case, used as a calibrating variable more so than a reflection of the probable price one could obtain in the market, i e , the price needed per pound in order to break even on the operation given the assumptions (including an acceptable profit margin) Based on an interview with Musson Foods, the current market for bulk seamoss is J$35—the price at which seamoss from the Philippines can be imported Musson Foods will buy Jamaican seamoss in minimum lots of 1,000 lbs, if the price is equal to or less than the J$35 per lb, which is slightly lower than the assumed price of J$42 per lb

The significance of the J$42 break even price is that, given the assumptions and the corresponding results discussed in Section 5 below, producers are close to the wholesale market price of J$35 per lb The more efficient the management, the lower will be the costs, and keen attention paid to the operation and maintenance of the exploitation will probably reduce costs further, and increase the growth rate, hence, it is not unreasonable to expect that producers will be able to lower the price to the J$35 break-even level or even below On the positive side, the price for dried seamoss sold in 1/4 lb plastic bags in the retail markets in and around Negril is currently J$140 per lb (or J$35 per 1/4 lb) At this high price, the seamoss operation would be financially very attractive The assumptions pertaining to the fisher families and the target for participation are discussed in detail in Section 5 below

4 3 4 Sustainable Tourism

Economic diversification through tourism is perceived as a desirable means to generate much-needed income for the Negril fisher families as evidenced by its inclusion in the fishermens' cooperative planning for the economic activities to be undertaken The perspective for the analysis is the fishermens' cooperative, or private sector on behalf of the cooperative (i e , an individual, an

NGO, and/or a consortium of private investors) who will provide some equity capital and seek financing for the rest In either case, if tourism is a real possibility, there should be active participation of the cooperative members in setting the tourism agenda (identifying the attractions local community involvement in terms of employment and income generation, development of souvenir and handicraft production, etc) While the concern related to tourism development is focused largely on the needs of the tourist, the cooperative also wants to strike a balance between the desires of visitors against the well-being of their hosts Tourism must benefit the local community and there must be broad-based participation in tourism development at the community level

The analysis is structured around a package for a tour group calibrated to the facilities available on the site(s)—in this case, 12 tourists per group, or just enough to fill up the rooms in the guest house The detailed assumptions pertaining to the tour group and the breakdown of the tourist expenditures are presented in detail in Annex B, Tables B 1 - B 7 below It is assumed that the group buys a round-trip 8-day package to Jamaica, including two days of travel and six days on the site The analytical framework is designed to accommodate three different sites, although only one is considered in the base case If tourism works well for the fishermen (i e , it is a financially attractive livelihood option), then investments in other sites may be considered in the long run [19] The assumptions (in Annex B) provide a detailed breakdown of the tourist dollar a) the tour package cost ($2,100 during the high season including two days travel[20])—the total amount paid to the travel agent in the US or Europe by each tourist for the total package, and b) the breakout of the expenditures per tourist on a daily basis into lodging, meals, local transport and entry fees Entry fees are included in the package although hotels in Negril or concessionaires do not now charge such fees for the use of the facilities (viewing the coral reefs, water sports, snorkeling, scuba diving, and the like) It is probable, however, that such fees will be imposed once the marine park has been declared[21] All of the information presented as assumptions in the tables in Annex B were collected from interviewing tourists and hotel operators in the area

Based on the assumptions, the on-site total cost per day per tourist of US$155 (see Table B 3) for the all-inclusive package is lower than the comparable daily rates charged by other hotels in the

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[19] The assumption here is conservative in view of the fact that most hotels can accommodate couples (double occupancy) in each room The 12 rooms should be able to accommodate a maximum of 24 tourists The group of 12 tourists therefore, will occupy all of the rooms if all travel as singles or only half of the rooms if all us the double occupancy option

[20] The cost for air transportation (US$325 as indicated in Table 4 5) will vary with the different outbound gateway cities Originating from Miami will cost less than originating from San Francisco

[21] The imposition of user fees is seriously considered for the Montego Bay Marine Park and the discussions currently focus on how best to collect such fees The prevailing view is to charge fees for different activities In the judgment of the team however such a system would cost far too much to administer Alternatively fees could be included in the all-inclusive packages paid by the tourists before departure as a small incremental addition to the cost of the tour package not enough to dissuade the tourist from coming Once the tourists have arrived in Negril all facilities will be available at no extra charge because payments will already have been made

area[22] A 63 percent occupancy rate for the guest house is assumed, or the same average rate experienced by all hotels in the Negril area for the past several years (Jamaica Annual Travel Statistics, 1996) The benefits are based on this occupancy rate multiplied by the profit margins associated with the lodging, meals, transportation and entry fees For example, if the charge for lodging is US$80 per day, the profit margin is estimated at 60 percent (based on field interviews) after having deducted all operating costs (except labor) such as for utilities, all cleaning and maintenance supplies, and wear and tear on the furniture, linen, and accessories, etc For the meals, the profit margin is similarly estimated at 50 percent, and for transportation, 30 percent, as indicated in Table B 4 in Annex B

With respect to the entry fees (see Box 1), only half is assumed to revert to the guest house as a benefit, the other half will be paid to Marine Park authorities (or to the NRCA—however a fee system is eventually set up) The portion of the fees reverting to the guest house is intended to help maintain the ecological and/or cultural/traditional integrity of the resources or attractions offered to the tourists

Box 1

The issue of entry fees is a hotly debated topic in Jamaica far from being resolved There seems to be some concensus on using the money collected to support the entity for which it was collected, i e , users are charged a small fee for the activities in which they engage In the opinion of the team, however, the costs of collecting entry fees and administering such a system would be very high, and it would invite corruption as too many people would handle the money Our recommendation for consideration would be to include a small general fee in the tour packages sold to be initially collected by the tour operators or travel agencies selling the tour packages For example, included in a package for a couple costing $3 500 for two weeks at resort X in Negril could be a small "entry fee" charge of $4 per bed night (or whatever the amount would eventually be) which would buy them free access to all of the activities and/or sights the resort have to offer while in Jamaica The small incremental addition to the total cost of the tour package would probably not dissuade the tourist from coming The challenge would be to determine an equitable distribution of the moneys collected between the different stakeholder, including the NRCA

Also included as part of the benefits (Table B 4 in Annex B) are additional expenditures made by the tourists per day Three categories are included a) souvenirs and handicrafts made by the fishermens' cooperative members, b) donations made by the tourists for maintenance of the ecological and cultural integrity of the area (the donations are presumed to be made in conjunction with the activities included in the tour package and hosted by the tour operators, i e , the guest house), and c) the sale of any educational materials prepared on behalf of the fisher families The latter could include small booklets providing information on various aspects of interest to the tourists, post cards, or photography books, and the like

The assumptions relating to the costs of the tourism infrastructure (construction of the guest house and other investments) are summarized in Tables 4 4 - 4 6 The conditions for the loans are laid out in Table 4 4 It is assumed that a low cost loan (15-percent) can be obtained with a payback period of five years including a 1-year grace period Given these assumptions, the annual loan

[22] The lower rates are assumed for the base case only It is not unreasonable to assume however that offering different and more varied tourism experiences with an ecological focus would not also command higher prices

payment will be nearly US$150,000 (based on the investments needed as outlined in Tables 4 5 and 4 6 below) The repayment amount is also based on an equity position in the venture of 30 percent, i e , the investors provide 30 percent of the capital needed Also part of the general input assumptions are number of salaried days per year for the workers (260 days), and the price for gasoline (US$0 33 per liter) for the tourist vans and motorcycles to be procured (see Table 4 5 below)

Table 4 4 Tourism Infrastructure, General Input Assumptions

Lending rate for tourism infrastructure	15 0%
Loan payback period pay back by year	5
Loan payback grace period (no years)	1
Loan payback per year US$	149,600
Equity position	30%
No salaried days per year (full time-year equivalent)	260
Gasoline price per liter	US$0 33

The capital costs (occurring in year 1) are summarized in Table 4 5 Land costs are not considered because the land will be deeded to the fisher families at no cost The 12-room tourist guest house (lodge) will be built for US$800 per m^2 (all cost estimates are based on field interviews with building contractors and others), assuming 45 m^2 per room (accounting for all other living space in the guest house such as corridors, living room, kitchen, dining room, etc) The garage and repair shop will do "double duty" by accommodating the needs of the guest house and, more importantly, the needs of the fisher families to have outboard motors and other gear repaired These facilities will be built for an estimated cost of US$250 per m^2 A solar energy installation should be considered for later as indicated in the table Vehicles to procure include two simple tourist vans at a cost of US$20,000 each, a glass bottom boat for coral reef excursions, and motorcycles for use for errands by the staff

Table 4 5 Tourism Infrastructure, Capital Costs (US$)

Capital Costs	Year	Site 1	Site 2	Site 3
Land acquisition year purchased and no hectares purchased	1	0	0	30
Price per hectare		$0	$0	$0
Tourist lodge year built and no of rooms	1	12	0	0
Cost per m2		$800	$0	$0
m2 needed per bed		45	0	0
Garage and repair shop year built & cost per m2	1	$250	$0	$0
m2 of garage/repair shop needed		80	0	0
Pool accessories and landscaping year built &cost per m2	1	$250	$0	$0
m2 needed		80	0	0
Solar installation year installed and total cost (turnkey)	1	$0	$0	$0
Vehicles all procured year	1			
Tourist vans procured @	$20,000	2	0	0
Glass bottom boats procured @	$16,000	1	0	0
Motorcycles procured for staff @	$2 800	2	0	0

The recurrent costs associated with the tourism infrastructure are summarized in Table 4 6 Included are building and vehicle maintenance expressed as percentages of the initial investment costs, the provision for the replacement of all vehicles (amortization), operating costs for the vehicles, and the payroll For the small guest house, the payroll included local guides, ground keepers, cooks and maids, and drivers and their daily wages Also included is a professional hotel manager at a salary level substantially higher than the rest of the staff The training and retraining needed over time is not budgeted because such training should probably be available through other donor projects such as Environmental Actions (ENACT) funded by the Canadian International Development Agency (CIDA), and/or through USAID's ongoing or future projects Finally, a small advertising budget per year of US$2,000 is included for the purpose of supplementing the advertising done by the Jamaica Tourism Board to selected US- and Europe-based clients

Table 4 6 Tourism Infrastructure, Recurrent Costs (US$)

Recurrent Costs				Site 1	Site 2	Site 3
Building maint /year (incl furniture linen etc) % of initial investment				0 75%	0 00%	0 00%
Vehicle maint (including tools and accessories) % of initial investment				5 00%	0 00%	0 00%
Provision for vehicle replacement per year				5 00%	0 00%	0 00%
Gas consumption tourist vans liters per year				1,000	0	0
Gas consumption glass bottom boat liters per year				1 200	0	0
Labor requirements	Site 1	Site 1	Site 1			
# local guides & salary/day	1	0	0	$15 00	$0 00	$0 00
# hotel managers & salary/day	1	0	0	$125 00	$0 00	$0 00
# ground keepers & salary/day	1	0	0	$15 00	$0 00	$0 00
# cooks/maids & salary/day	3	0	0	$25 00	$0 00	$0 00
# drivers & salary/day	1	0	0	$15 00	$0 00	$0 00
Marketing advertising and communications costs				$2 000	$0	$0

4 4 Financial Analysis

The results of the analyses for all three interventions are presented in sections 4 5 1 - 4 5 3 below for the aquaculture seamoss, and tourism interventions, respectively All of the results are based on the detailed assumptions summarized above and, thus, only reflect one of several possible scenarios

4 4 1 Fish Farming Aquaculture

Given the assumptions presented in Table 4 2, the results given in Table 4 7 indicate a strong financial feasibility for the aquaculture intervention—a positive NPV and an IRR higher than the opportunity cost of capital (i e , the assumed 25-percent discount rate) The negative cash flow in year 1 is largely attributable to assumption that only a partial production will take place during the first year to account for the construction time and the startup difficulties The table also indicates that neither costs nor benefits increase (or decrease) over time, this is in accordance with the assumption that real costs and benefits remain constant over the analytical time horizon

The IRR of 39 percent per pond is optimistic compared with results from other aquaculture operations It is, however, not an unrealistic result if the ponds are well constructed and well managed One key variable is the production of fish during the year of construction because early revenues have a much higher impact on the NPV and IRR than do late revenues If the management is poor and only half of one production cycle can be completed the first yer, the IRR drops immediately to 25 percent, or the break even point where costs just equal benefits

Table 4 7 Results per Pond (J$)

Year	Lbs of Fish Produced	Constr Cost + Land Lease	Pond labor + Pump Rent	Fingerlings +Feed	Total Cost	Total Revenues	Net Cash Flow
1	4320	125000	333000	90720	548720	302400	-246320
2	8640	15000	333000	159840	507840	604800	96960
3	8640	15000	333000	159840	507840	604800	96960
4	8640	15000	333000	159840	507840	604800	96960
5	8640	15000	333000	159840	507840	604800	96960
6	8640	15000	333000	159840	507840	604800	96960
7	8640	15000	333000	159840	507840	604800	96960
8	8640	15000	333000	159840	507840	604800	96960
9	8640	15000	333000	159840	507840	604800	96960
10	8640	15000	333000	159840	507840	604800	96960
11	8640	15000	333000	159840	507840	604800	96960
12	8640	15000	333000	159840	507840	604800	96960
13	8640	15000	333000	159840	507840	604800	96960
14	8640	15000	333000	159840	507840	604800	96960
15	8640	15000	333000	159840	507840	604800	96960
NPV					1992592	2092162	99570
IRR							39 0%

4 4.2 Seamoss Farming Mariculture

The evolution of costs for the seamoss farming intervention given the assumptions in Table 4 3 above is presented in Table 4 8 The costs include the investments in rope, the planting material, the tire anchors, the plastic bags, the drying and storage shed, and all labor

The benefits from the seamoss operation and the net cash flows (benefits minus costs) are summarized in Table 4 9, again indicating strong financial feasibility based on very conservative assumptions The seamoss volume harvested per year per operation is 650 lbs (or 50 meters of lines x 0 25 lbs production per meter per week x 52 weeks = 650 lbs) This volume multiplied by the assumed price per pound equals an annual total revenue of J$26,650 From the discussion of the assumptions above, recall that the seamoss J$42 price per lb was used as a calibrating variable This price was intended to test whether the cost of seamoss production would be sufficiently low to consider the wholesale market (primarily Musson Food) where the maximum price paid is currently J$35 per lb At the J$35 per pound, the NPV per seamoss operation would be negative, i e , the price would have to be slightly higher, at least J$41 per lb in order to break even, and J$42 per lb to move into the profitability range In reality, however, the retail market offers much more attractive prices—up to J$140 per pound for dried seamoss packaged in 1/4-lb plastic bags sold to local retail

outlets At this price, the seamoss operation would be financially very attractive—all investment costs incurred would be recovered within the first year

Table 4 8 Costs per Seamoss Exploitation (J$)

Year	Capital Costs					Install & Out plant Labor	Maint & Process Labor	Total Costs
	Rope	Planting Mat	Anchors	Plastic Bags	Drying shed			
1	3125	3000	1400	4800	20000	1750	16250	50325
2	625	0	0	3600	0	0	16250	20475
3	625	0	0	3600	0	0	16250	20475
4	625	0	0	3600	0	0	16250	20475
5	625	0	0	3600	0	0	16250	20475
6	625	0	0	3600	0	0	16250	20475
7	625	0	0	3600	0	0	16250	20475
8	625	0	0	3600	0	0	16250	20475
9	625	0	0	3600	0	0	16250	20475
10	625	0	0	3600	0	0	16250	20475
11	625	0	0	3600	0	0	16250	20475
12	625	0	0	3600	0	0	16250	20475
13	625	0	0	3600	0	0	16250	20475
14	625	0	0	3600	0	0	16250	20475
15	625	0	0	3600	0	0	16250	20475

Table 4 9 Benefits and Net Cash Flows per Seamoss Exploitation (J$)

Year	Volume Harvested/yr	Harvest Value	Net Cash Flow
1	650	27300	-23025
2	650	27300	6825
3	650	27300	6825
4	650	27300	6825
5	650	27300	6825
6	650	27300	6825
7	650	27300	6825
8	650	27300	6825
9	650	27300	6825
10	650	27300	6825
11	650	27300	6825
12	650	27300	6825
13	650	27300	6825
14	650	27300	6825
15	650	27300	6825
NPV			2459
IRR			28 8%

4 4 3 Sustainable Tourism

Several of the results for the tourism intervention not directly related to the guest house but instead to the tour groups are summarized in Tables B 5 - B 9 in Annex B below[23] These tables demonstrate the necessary condition that the tourism option must be profitable not only for the guest house in Negril, but for the tour operators as well Given the prices charged per tourist, will the tour operator make an adequate profit? As indicated in Table B 5, each tour package will generate a profit level of 12 6 percent net of all costs The airfare accounts for more than 19 percent of the total tour package while lodging accounts for the biggest share—28 3 percent of the total package The computed average cost per day per tourist, all costs included, is US$263 Given the assumptions (which do not deviate much from the rest of the industry), it is concluded that tours to Negril of this configuration would be a profitable undertaking for the tour operator

Given the assumptions, the total benefits accruing to the guest house is an estimated US$163 per day per tourist as indicated in Table B 6 (Annex B), including those that are part of the tour package (lodging, meals, local transportation, and entry fees), and additional expenditures for souvenirs, donations, and for miscellaneous educational materials The US$163 per day is total revenues collected by the guest house The net benefits amount to only US$86 30 per day, given the profit margins discussed above

In the aggregate (Table B 7 Annex B), the visitor capacity for the guest house is 4,380 bed nights per year (12 beds x 365 days) At an average (assumed) occupancy rate of 63 percent per year, nearly 2,800 bed-nights will be sold annually, or equal to total annual revenues of nearly US$450,000

The detailed results for the infrastructure investments (capital and recurrent costs) are presented in Table B 8 and B 9 in Annex B Given the assumptions, the building will cost US$432,000, the garage and repair shop US$20,000, and the pool and accessories another US$20,000 All vehicles (tourist vans, glass bottom boat, and motorcycles) will cost slightly in excess of US$61,000 The recurrent costs include operating and maintenance costs for buildings and vehicles and amortization cost for the vehicles Also included is the payroll (labor costs)

All costs and benefits are summarized on an annual basis in Table 4 10 below All values are in US dollars Based on the assumptions, the tourism option is deemed financially feasible since the NPV is greater than zero and the IRR exceeds the assumed 15-percent opportunity cost of capital It is important to note also that these results are obtained assuming an occupancy rate of only 63 percent If this were increased by only seven percent (to 70 percent), the IRR would increase from 19 6 percent to 23 9 percent

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[23] As mentioned earlier the tourism intervention is much more complex to analyze and, thus requires more space and attention in this report This does not mean however that the tourism is in any way preferred over the other interventions

Table 4 10 Summary of Benefits and Costs (US$)

Year	Site 1	Site 2	Site 3	Total Benefits	Total Costs	NCF
1	0	0	0	0	604 510	(604,510)
2	238 136	0	0	238 136	140 505	97 631
3	238 136	0	0	238 136	140 505	97 631
4	238 136	0	0	238 136	127 673	110 463
5	238 136	0	0	238 136	112 917	125 220
6	238 136	0	0	238 136	95 947	142 190
7	238 136	0	0	238 136	76 431	161 705
8	238 136	0	0	238 136	76 450	161 687
9	238 136	0	0	238 136	76 450	161 687
10	238 136	0	0	238 136	76 450	161 687
11	238 136	0	0	238 136	76 450	161 687
12	238 136	0	0	238 136	76 450	161 687
13	238 136	0	0	238 136	76 450	161 687
14	238 136	0	0	238 136	76 450	161 687
15	238,136	0	0	238,136	76,450	161,687
NPV				1,185,396	1,052,604	132 792
IRR						19 6%

5 AGGREGATION AND SENSITIVITY ANALYSIS

5 1 Introduction

The analyses presented in the previous section were based on operations of certain configurations—a one-pond aquaculture facility, a seamoss farming operation with (10 lines of rope for a total of 50 meters), and a tourism venture with a small 12-room guesthouse as the key feature Obviously, different configurations can be tested, both smaller and larger Nevertheless, the preliminary analyses indicate that all interventions are within the range of financial feasibility, i e , the participant fisher families would be better off income-wise than without them In this section, the interventions are aggregated in accordance with the targets specified in the assumption tables (see Section 4) and a sensitivity analysis of the base case assumptions is carried out

5 2 Development Targets

The assumed development targets are modest For the aquaculture intervention it is assumed in Table 4 2 that only 50 acres (or 50 1-acre ponds) will be developed over a 5-year period, or the equivalent of 10 ponds per year This means (theoretically) that up to 50 fisher families (or 10 percent from a target audience of some 500) could become involved with aquaculture in independent operations, or fewer operations will be established on larger areas of land with more than one pond It could also mean that at least one member from each family could potentially take up aquaculture as an alternative livelihood option Similarly, for the seamoss intervention it is assumed that 10 percent of the fisher families (50) will adopt the interventions over a 10-year period, or one member from each family[24] The overall impacts on the total population of fisher families from these two interventions will of course increase if the targets are raised and fishermen successfully adopt the technologies As mentioned above, the probable fact that all three interventions are deemed financially feasible from the fishermens' perspective does not necessarily mean that they will be adopted Half-hearted attempts at using scarce fishing time for non-fishing pursuits such as seamoss farming, aquaculture and/or tourism will eventually fail If, on the other hand, there is dedication and commitment to these alternative interventions, the probability is high that the fishermen may eventually succeed, even to the point where the interventions take over as full, not just part-time, activities

5 3 Aggregate Results

The aggregate results for the aquaculture and seamoss activities are summarized in Tables 5 1 and 5 2 below As indicated in the first column of Table 5 1, the cumulative number of ponds increases from 10 ponds in year 1 to the target number of 50 ponds in year 5 The second and third

[24] One reason for the relatively modest aquaculture and seamoss targets is the availability of land and clean water for the former and the allocation of property rights in suitable areas for the latter Another reason is to involve all fisher families (i e one member per family) although they are not necessarily evenly distributed between the different candidate bays for lack of precise information on the number of fisher families in each bay

columns show the volumes of fish produced over time and values (benefits) generated from the fish sold The costs (the fourth column) are deducted from the benefits to generate the stream of net cash flows (NCF) in the sixth column which is subjected to the NPV and IRR calculations As indicated, the intervention in the aggregate is financially feasible in view of the positive NPV and IRR higher than the assumed opportunity cost of capital

Table 5 1 Aggregate Benefits From Aquaculture Operation (J$)

Year	Cumul # Ponds	Lbs of Fish Produced	Benefits	Costs	Net Cash Flow
1	10	43200	3024000	5487200	-2463200
2	20	129600	9072000	10565600	-1493600
3	30	216000	15120000	15644000	-524000
4	40	302400	21168000	20722400	445600
5	50	388800	27216000	25800800	1415200
6	50	432000	30240000	25392000	4848000
7	50	432000	30240000	25392000	4848000
8	50	432000	30240000	25392000	4848000
9	50	432000	30240000	25392000	4848000
10	50	432000	30240000	25392000	4848000
11	50	432000	30240000	25392000	4848000
12	50	432000	30240000	25392000	4848000
13	50	432000	30240000	25392000	4848000
14	50	432000	30240000	25392000	4848000
15	50	432000	30240000	25392000	4848000
NPV			68935543	65811969	3123574
IRR					38 7%

The seamoss operation in the aggregate exhibits similar results to the aquaculture intervention as indicated in Table 5 2 All costs and benefits associated with the cumulative participation of five operations in year one increasing to 50 operations in year 10 are summarized in the table The aggregate NCF subjected to the NPV and IRR calculations indicate reasonably strong financial feasibility As with the aquaculture case, any change in the targets and/or change in any of the input assumptions will generate different streams of benefits and costs In both cases, the assumptions used in the base case are very conservative For example, only two harvests from the aquaculture facility are assumed—three harvests are probable For the seamoss option, a production of only 0 25 lbs per meter per week is assumed—more than twice this level is probable Improved performance in both cases depends on the efficiency with which the operations are managed and operated

Finally, since only one tourism guest lodge is envisioned, the results for the tourism option presented in the previous section are also the aggregate results Again, the assumptions used in the base case are very conservative The results are based on several tour packages sold per year where the average **room** occupancy rate does not exceed 63 percent Not counted here is the fact that the rooms can be double occupancy, i e , the guest house could accommodate up to 24 people The results, therefore, are based on a very low bed occupancy rate, and, the results still show reasonably strong feasibility for both the outbound tour operator and the guest house owners (i e , the Negril fishermen)

As a final note to this section, it is important to acknowledge that, for low income fisher families, the incidence of negative net cash flows for several years before positive cash flows appear may be difficult if not an impossible financial burden for most if these were true out-of-pocket costs In this context, however, it is important to understand that a large portion of these negative cash flows are labor costs that the fishermen would not count anyway, at least not when they are fishing Fishermen do not account for the labor expended in the process of catching the fish In the analyses presented above, however, labor is costed at the assumed opportunity cost of J$250per day per person These (labor) costs dominate most of the negative NCFs in the tables

Table 5 2 Aggregate Benefits From Seamoss Operation (J$)

Year	Cumulative Participation	Aggregate Product (Lbs)	Aggregate Benefits	Aggregate Costs	Aggregate NCF
1	5	3250	136500	251625	-115125
2	10	6500	273000	354000	-81000
3	15	9750	409500	456375	-46875
4	20	13000	546000	558750	-12750
5	25	16250	682500	661125	21375
6	30	19500	819000	763500	55500
7	35	22750	955500	865875	89625
8	40	26000	1092000	968250	123750
9	45	29250	1228500	1070625	157875
10	50	32500	1365000	1173000	192000
11	50	32500	1365000	1023750	341250
12	50	32500	1365000	1023750	341250
13	50	32500	1365000	1023750	341250
14	50	32500	1365000	1023750	341250
15	50	32500	1365000	1023750	341250
NPV					28293
IRR					27 3%

5 4 Sensitivity Analysis

The sensitivity analysis is used to test the sensitivity of the results to changes in the base case assumptions The base case NPV results in the aggregate are reproduced in the middle column of Table 5 3, all indicating financial feasibility as they are all positive The question asked in the sensitivity analysis is what happens to the NPV results if the base case assumptions are increased or decreased in increments of 10 percent? The information sought is switching values—at what point will the NPV switch from positive to negative, or how much of an increase in costs or a decrease in benefits can the interventions tolerate before they cease to be financially feasible?

Beginning with the aquaculture intervention, the discount rate can increase by more than 30 percent before the NPV switches to negative as indicated in the table (of from 25 percent to more than 32 5 percent) The results, however, are very sensitive to any changes in the cost assumptions—an increase of less than 10 percent will switch the NPV from positive to negative On the other hand, only a slight decrease in costs will greatly increase the NPV Given the conservative assumptions used for this intervention, it is probable that the base case costs assumptions are already

slightly elevated, hence cost reductions are more probable than cost increases With respect to the benefits, these are equally sensitive as only a slight decrease in the assumed price for the fish will switch the NPV from positive to negative Again, however, the benefit assumptions are conservative, particularly with respect to the number of production cycles in any given year Only two harvests per year was assumed in the base case, three harvests are very much within the realm of possibility (as mentioned above)

The seamoss farming intervention is also particularly sensitive to changes in any of the base case assumptions This is to be expected, however, since the results presented for this intervention were already calibrated with the price to be near the break even level, i e, any change in the assumptions will cause the NPV to switch The base case price of J$42 generates the aggregate NPV of J$28,293 which roughly defines the break even point This price is slightly higher than the J$35 price needed to supply the bulk wholesale market, but much lower than the prices paid in the alternative local retail market If the wholesale market is ruled out and the operators opt to sell in the retail market, then the sensitivity analysis would exhibit much different results as the assumptions (particularly on the benefit side) would be much less sensitive[25]

The NPV results for the tourism option are less sensitive to changes in the base case assumptions As indicated in the table, the discount rate can increase by more than 30 percent before the NPV switches from positive to negative (at the 30-percent level, the NPV is nearly zero, or at the break even point) Costs could increase and benefits decrease by more than 10 percent, respectively, and the NPV would still remain in the range of feasibility The occupancy rate could also decrease by more than 10 percent before the NPV result switches

Table 5 3 Sensitivity Analysis of Aggregate Results

Interventions	-30%	20%	10%	Base Case	10%	20%	30%
Aquaculture (J$)							
Discount rate	7267689	5558703	4204180	3123574	2256382	1556754	989652
Costs	22867164	16285968	9704771	3124574	-3457623	-10038820	-1662007
Benefits	-17557089	10663535	-3769981	3123574	10017128	16910682	23804237
Production cycles	-10642190	-6053602	-1465014	3123574	7712162	12300749	16889337
Seamoss (J$)							
Discount rate	191872	121937	66813	28293	-2709	26474	-44701
Costs	693234	471587	249940	28293	-193354	-415001	-636648
Benefits	645136	420660	-196183	28293	252769	477245	701721
Tourism (US$)							
Discount rate	334963	257349	190517	132792	82788	39355	1533
Costs	482362	365838	249315	132792	16268	-100255	-216778
Benefits	203048	-91101	20845	132792	244738	356684	468631
Occupancy rate	222827	104287	14252	132792	251331	369871	488410

[25] It is important to note that the adoption of the seamoss intervention by 50 Negril fisher families given the assumptions will increase the supply of seamoss in the region and thus drive the market price for the 1/4-lb packets down from the current level of J$35 per packet to a significantly lower level The extent to which the price will reduce is not known although it is highly improbable that the price will decline to a level where the intervention is no longer financially feasible

5 5 Risks

An important observation made by the team is the fact that respondents (the individuals and institutions interviewed) would, more often than not, offer negative comments about the options chosen as candidates for analysis a) " fish farming (aquaculture) will not work because fishermen are not farmers," b) " fishermen will never become proficient tourism operators or be able to work effectively as employees for hotels or tour operators," or c) " seamoss farming will not work because Musson Food (the largest market for bulk seamoss for Negril fishermen) can import the moss from the Philippines for less than it would cost to produce it in Jamaica," etc These comments are all valid in many, but not all, circumstances To some extent, fisher families in Jamaica have tried these interventions before and have often failed In nearly all cases, however, the failures are not attributable to the interventions, they are more easily attributable to fisher families' lack of social organization and commitment to the interventions If one is to take up aquaculture and/or seamoss farming, there must be commitment and dedication to the venture, with the realization that less time will be available for fishing There are real risks, therefore, in supporting the fisher families in implementing interventions like these, simply because their intent is to reduce fishing effort—an intent probably not highly esteemed by dedicated fisher families Any interventions different from fishing would fall in this category

5 6 Support From USAID/Jamaica and DEMO

In view of the results presented in this report and the inherent risks, USAID/Jamaica is encouraged to pursue an extension of the DEMO Project with a focus on providing support for the Negril fisher families The kind of support offered, however, must be comprehensive so as to minimize the risk of fisher families abandoning the interventions when faced with minor obstacles NEPT and NCRPS are probably the key NGO institutions through which the support should flow since they are in daily touch with the fishermen and the cooperative The most important kind of support will probably be in the area of identifying funding sources, or providing guarantees on behalf of the cooperative for funding through the cooperative The institutions, therefore, must be considerably strengthened in the areas of financial analysis and management, economics, and accounting, and in how to prepare bankable proposals for the funding institutions This expertise must be passed on to the participating fisher families and/or cooperative structure on a continuous basis

It is equally important that the NRCA be considerably strengthened in the areas of economic and financial analysis—the capacity to determine if the environmental proposals put forth under the auspices of DEMO and/or other donor projects make financial and economic sense Such expertise is woefully lacking at NRCA

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ANNEX A INDIVIDUALS AND INSTITUTIONS CONTACTED

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ANNEX B TOURISM ASSUMPTIONS AND RESULTS

1 Input assumptions not included in the main text

Table B 1 No of Tourists and the Tourism Package

No of tourists per group	12
Length of tour and site visitations	
Departure en route to destination no days	1
Visit to site 1 no days	6
Visit to site 2 no days	0
Visit to site 3, no days	0
Return travel	1
Total number of days for the tour package	8

Table B 2· Breakdown of the Tourism US Dollar (1)

Tour Package, Costs			Hi Season	Lo Season
Price/tourist RT from US or European gateway city			$2,100	$1 800
International airfare			$325	$300
No of outbound tour guides needed	1	Salary/day/tourist	$12	$12
No of inbound tour guides needed	0	Salary/day/tourist	$0	$0
Inbound tour supplier (guest house) required profit margin	12%		NA	NA
Advertising (% of total cost) by outbound operator	5%		NA	NA
Overhead (% of total costs) by outbound operator	10%		NA	NA

Table B 3 Breakdown of the Tourism US Dollar (2)

HI SEASON cost/day/tourist	Lodging	Meals	Transport	Entry Fees
Site 1	$80	$50	$20 00	$5
Site 2	$0	$0	$0 00	$0
Site 3	$0	$0	$0 00	$0
LO SEASON cost/day/tourist	**Lodging**	**Meals**	**Transport**	**Entry Fees**
Site 1	$60	$30	$20 00	$5
Site 2	$0	$0	$0 00	$0
Site 3	$0	$0	$0 00	$0

Table B 4: Occupancy Rates and Profit Margins

Income sources	Site 1	Site 2	Site 3	Profit
Assumed occupancy rate per year	63%	0%	0%	NA
Occupancy rate year 1 (after construction)	0%	0%	0%	NA
Lodging				60%
Meals				50%
Transportation				30%
Entry fees				50%
Souvenirs/handicrafts avg per day	US$5	$0	$0	60%
Donations by tourists avg per day	US$1	$0	$0	100%
Educational materials avg per day	US$2	$0	$0	40%

2 Results not included in the main text

Table B 5 Cost per Group and Operator Profit Margins (US$)

Outbound tour operator				TC/Group	%
International airfare (group rate)				$4 225	19 2%
Outbound tour guide salary per tour				$1 296	5 9%
Gateway (US), departure & return, lodging, meals and other misc expenses				$0	0 0%
Subtotal, outbound				$5,521	25 1%
All costs per site	Site 1	Site 1	Site 1		
Lodging	$6 240	$0	$0	$6 240	28 3%
Meals	$3 900	$0	$0	$3 900	17 7%
Transportation (on site 1)	$1 560	$0	$0	$1 560	7 1%
Entry fees	$390	$0	$0	$390	1 8%
Inbound supplier profit margin				$1 451	6 6%
Subtotal, subcontract to inbound operator				$13,541	61 5%
Advertising costs incurred by outbound operator				$953	4 3%
Overhead costs incurred by outbound operator				$2,001	9 1%
Total cost per group				$22,016	100 0%
Average cost per day per tourist			$263		
Total revenues per group				$25,200	
Net revenues (profits) per group				$3 184	12 6%

Table B 6 Expenditures per Tourist per Day (US$)

Cost Categories	Site 1	Site 2	Site 3	Total	Benefits
Lodging	$80	$0	$0	$80	$48 00
Meals	$50	$0	$0	$50	$25 00
Local transportation	$20	$0	$0	$20	$6 00
Entry fees	$5	$0	$0	$5	$2 50
Souvenirs/handicrafts	$5	$0	$0	$5	$3 00
Donations by tourists	$1	$0	$0	$1	$1 00
Educational materials	$2	$0	$0	$2	$0 80
Grand Total Per Tourist	$163	$0	$0	$163	$86 30

Table B 7 Aggregate Revenues Generated by Sites (US$)

	Site 1	Site 2	Site 3	Total
Visitor capacity per year	4 380	0	0	NA
Visitors bed nights per year	2759	0	0	2 759
Total expenditures by tourists/year	449 782	0	0	449 782

Table B 8 Infrastructure Investments (US$)

Capital Costs Land, Buildings, Transportation, etc	Site 1	Site 2	Site 3	Total
Land acquisition total cost	$0	$0	$0	$0
Building construction (turnkey)				
Tourist lodge no of beds (incl furniture linen etc)	$432 000	$0	$0	$432 000
Garage and repair shop	$20 000	$0	$0	$20 000
Pool accessories and landscaping	$20 000	$0	$0	$20 000
Vehicles				
Tourist vans	$40 000	$0	$0	$40 000
Glass bottom boat	$16 000	$0	$0	$16 000
Motorcycles for staff	$5 600	$0	$0	$5 600
Recurrent costs				
Bld g maint /year (incl furniture linen etc) % of initial inv	$3 540	$0	$0	$3 540
Vehicle maint % of initial invest (incl tools accessories)	$3 080	$0	$0	$3 080
Provision for vehicle replacement per year	$3 080	$0	$0	$3 080
Gas consumption tourist van liters per year	$656	$0	$0	$656
Gas consumption glass bottom boat liters per year	$394	$0	$0	$394
Local guides and rangers annual payroll	$3 900	$0	$0	$3 900
Local interpreters annual payroll	$32 500	$0	$0	$32 500
Ground keepers annual payroll	$3 900	$0	$0	$3 900
Maids and cooks annual payroll	$19,500	$0	$0	$19 500
Drivers annual payroll	$3 900	$0	$0	$3 900
Marketing advertising, and communications costs	$2,000	$0	$0	$2,000
TOTAL	$610 050	$0	$0	$610 050

Table B 9 Summary of Investment Costs (US$)

	Capital Costs			Recurrent Costs				
Year	Land Acquisition	Building Construction	Vehicles Boats & Motorcycles	Buildings Mainten + Linen & Furnit	Veh Oper Costs+Maint + Replacement	Payroll	Training, Marketing + Debt Service	Total
1	0	472 000	61 600	0	7 210	63 700	0	604 510
2	0	0	0	3,540	7 210	63 700	66 055	140 505
3	0	0	0	3 540	7 210	63 700	66 055	140 505
4	0	0	0	3 540	7 210	63 700	53 223	127 673
5	0	0	0	3 540	7 210	63 700	38 467	112 917
6	0	0	0	3 540	7 210	63 700	21 497	95 947
7	0	0	0	3 540	7 210	63 700	1 982	76 431
8	0	0	0	3 540	7 210	63 700	2 000	76 450
9	0	0	0	3 540	7 210	63 700	2 000	76 450
10	0	0	0	3 540	7 210	63 700	2 000	76 450
11	0	0	0	3 540	7 210	63 700	2 000	76 450
12	0	0	0	3 540	7 210	63 700	2 000	76 450
13	0	0	0	3 540	7 210	63 700	2 000	76 450
14	0	0	0	3 540	7 210	63 700	2 000	76 450
15	0	0	0	3 540	7 210	63 700	2 000	76 450

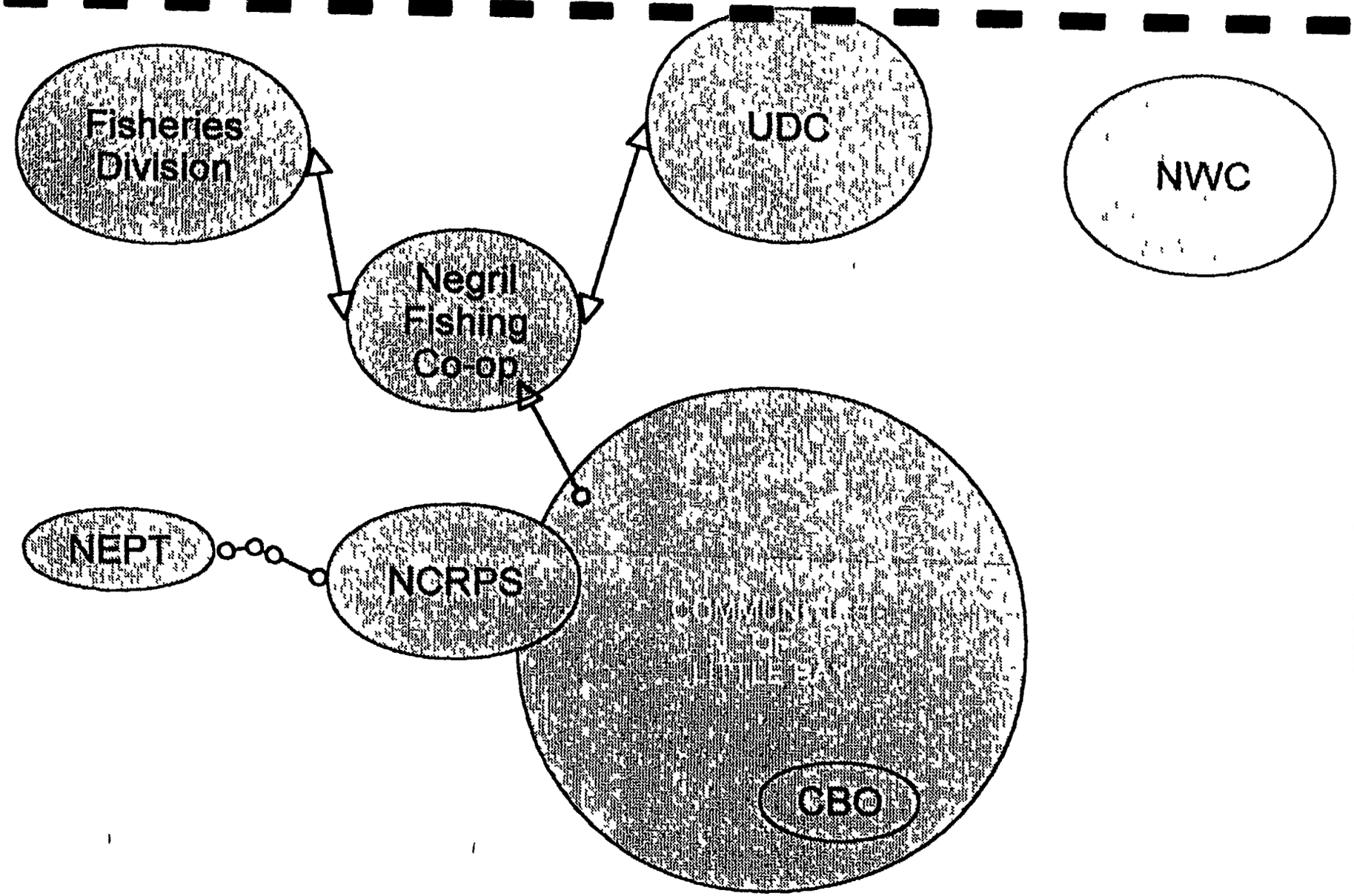

Diagram showing Little Bay Communities *perception* of institutional representation

size of circle = perception of importance of institution, spatial distance = degree of representation & contact, Arrows show perceived linkages between institutions - where arrows omitted, link is weak or non-existent Chain link between NCRPS & NEPT = community perception of them as one entity CBO refers to the Community Group at Little Bay